

COLUMBIA LIBRARIES OFFSITE
HEALTH SCIENCES RESTRICTED



HR00237388

SERIAL

V. 38

M

1909/10

Columbia University
in the City of New York

College of Physicians and Surgeons



Library

LETTER OF TRANSMITTAL.

OFFICE OF THE
SECRETARY OF THE STATE BOARD OF HEALTH,
LANSING, MICHIGAN, DECEMBER, 1910.

TO HON. FRED M. WARNER, *Governor of Michigan:*

SIR:—In compliance with the laws of this State, I present to you the accompanying report for the fiscal year ending June 30, 1910.

Very respectfully,

FRANK W. SHUMWAY,
Secretary of the State Board of Health.

MEMBERS

OF THE

MICHIGAN STATE BOARD OF HEALTH.

	TERM EXPIRES.
ANGUS McLEAN, M. D., <i>President</i> , Detroit.....	January 31, 1911.
MALCOLM C. SINCLAIR, M. D., <i>Vice-President</i> , Grand Rapids.....	January 31, 1911.
FRANK W. SHUMWAY, M. D., <i>Secretary and Executive Officer</i> , Lansing.....	March 30, 1911.
VICTOR C. VAUGHAN, M. D., Ph. D., Ann Arbor.....	January 31, 1913.
AARON R. WHEELER, M. D., St. Louis.....	January 31, 1913.
CHARLES A. BLAKE, Detroit.....	January 31, 1915.
CHARLES M. RANGER, A. B., Battle Creek.....	January 31, 1915.

THIRTY-EIGHTH ANNUAL REPORT
OF THE
SECRETARY
OF THE
STATE BOARD OF HEALTH
OF THE
STATE OF MICHIGAN
FOR THE
FISCAL YEAR ENDING JUNE 30, 1910.



BY AUTHORITY

LANSING, MICHIGAN
WYNKOOP HALLENBECK CRAWFORD CO., STATE PRINTERS
1911

CONTENTS.

	Page.
Title page.....	1
Letter of transmittal to Governor Warner.....	3
Members of the State Board of Health.....	5
Contents.....	7
Regular and special meetings of the Board, fiscal year, 1910.....	11-13
Examination of plans for State buildings.....	13
Examination and licensing of embalmers.....	14
General and special work and expenditures, in the office of the secretary, fiscal year, 1910.....	14-46
Communicable diseases, in Michigan, in 1909 and preceding years.....	49-165
Introduction.....	49-50
Pneumonia.....	50-63
Tuberculosis.....	64-83
Meningitis.....	84-93
Typhoid fever.....	94-109
Diphtheria.....	110-121
Whooping-cough.....	122-127
Scarlet fever.....	127-138
Measles.....	138-151
Smallpox.....	151-164
Chicken-pox (Varicella).....	164
Mumps (Parotitis).....	164
Erysipelas.....	164
Leprosy.....	164
Tetanus (Lock-jaw).....	165
Diseases of animals, dangerous to man, in Michigan, in 1909.....	165
Rabies (Hydrophobia).....	165
Glanders (Farcy).....	165
Actinomyecosis (Lumpy jaw).....	165
Alleged nuisances, in Michigan, in 1909.....	166

PART I.

REPORT OF THE SECRETARY FOR THE FISCAL YEAR,
JULY 1, 1909, TO JUNE 30, 1910.

EXTRACTS FROM MINUTES OF BOARD MEETINGS.

SPECIAL MEETING, HELD AT DETROIT, JULY 1, 2 AND 3, 1909.

The members present were: President Angus McLean, M. D., Charles M. Ranger A. B., Charles A. Blake and Frank W. Shumway, M. D., Secretary.

The meeting was called for the purpose of conducting an embalmers' examination, forty-six candidates being examined.

REGULAR MEETING, HELD AT LANSING, JULY 9, 1909.

The members present were: Vice-President M. C. Sinclair, M. D., A. R. Wheeler, M. D., Victor C. Vaughan, M. D., Charles A. Blake, Charles M. Ranger and F. W. Shumway, M. D., Secretary.

Because of the fact that many letters had been received requesting this Board to grant embalmers' licenses, without examination, to graduates of schools where the art of embalming is taught, the following resolution was adopted by the Board:

Resolved, That the State Board of Health does not recognize any school of embalming.

Messrs. Ranger and Blake were appointed delegates to represent this Board at the Sixth Annual Conference of the Embalmers' Examining Boards of North America, to be held at Louisville, Kentucky, August 18, 1909.

The following resolution was adopted by the Board:

Resolved, That the State Board of Health empower its Secretary, when extraordinary conditions arise endangering the health of any community in the State and demanding immediate action, to act as State medical inspector, or to appoint some other member of the Board or some other suitable person to act as State medical inspector with full power to enforce all rules and regulations of the State Board of Health.

Dr. Shumway was instructed to draft the necessary rules and regulations for carrying out the provisions of the new laws relative to public health.

REGULAR MEETING, HELD AT LANSING, OCTOBER 8, 1909.

The members present were: President Angus McLean, M. D., Vice-President Malcolm C. Sinclair, M. D., Aaron R. Wheeler M. D., Charles M. Ranger, A. B., Charles A. Blake and F. W. Shumway, M. D., Secretary.

The Secretary read the reports of the investigations made in various localities by himself and others acting as medical inspectors.

The following resolution was adopted by the Board:

WHEREAS; The common drinking cup is a source of spreading disease and a menace to public health, therefore be it

Resolved, That the Secretary prepare and issue notices to railroads and public schools forbidding the use of the common drinking cup, and be it further

Resolved, That the Secretary instruct the local health officers to see that this rule is enforced.

The report of the investigation, made by the Secretary of this Board and Surgeon-General Wyman, of Washington, D. C., relative to a case of leprosy in Calumet township, was read to the Board.

Owing to the fact that the State laws do not provide for the care of persons afflicted with leprosy, and at the suggestion of Dr. Wyman that the United States government should take some action along this line, the following resolution was offered and adopted:

WHEREAS; Leprosy is present in this State, and there is no provision made in the laws for the care of the lepers or their families, if indigent, therefore be it

Resolved, That the Secretary of this Board shall concur in any suggestions made by Surgeon-General Wyman toward the establishment of a leprosarium for the care of lepers.

According to a request at a previous meeting, that the Secretary draft necessary rules and regulations for carrying out the provisions of the new laws relative to public health, the same were submitted to the Board for their approval.

The fact that the appropriation of this Department is too limited to defray the expense of circulating the tuberculosis primer among the school children of the State, it was suggested that the next Quarterly Bulletin of this Board be devoted to the subject contained in the primer and the publication of the new tuberculosis law, so that the same might be read by the teachers of public schools. The suggestion was concurred in by the Board.

REGULAR MEETING, HELD AT LANSING, JANUARY 14, 1910.

The members present were: President Angus McLean, M. D., Chas. A. Blake, Chas. M. Ranger and F. W. Shumway, M. D., Secretary.

The reports of the medical inspectors, relative to their investigations during the last quarter, were submitted to the Board.

The Secretary was instructed to notify the Secretary of the Idaho State Board of Health that this Board is in a position to enter into reciprocal relations with the Idaho Board of Health, relative to the granting of embalmers' licenses.

SPECIAL MEETING, HELD AT LANSING, MARCH 14, 1910.

The members present were: Vice-President M. C. Sinclair, M. D., Victor C. Vaughan, M. D., and F. W. Shumway, M. D., Secretary.

The plans and specifications of the water purification plant at Grand Rapids were submitted to this Board for their consideration and approval. After due consideration the same were approved.

The Secretary was instructed to invite all railroad companies, doing business in this State, to send representatives to confer with this Board relative to ways and means of carrying out the provisions of the law relative to the sanitary conditions of railroad coaches, depots, etc.

The following resolution was adopted by the Board:

WHEREAS; The State Board of Health is given supervisory power over the sanitary conditions of the public schools of the State, and

WHEREAS; It has been demonstrated that disease has been disseminated by the use of the common drinking cup, therefore be it

Resolved, That the State Board of Health requests the directors of every school in the State to equip their buildings with individual drinking cups or

with some device that will take the place of the common drinking cup; and be it further

Resolved, That the State Board of Health expects that the request contained in this resolution will be fully complied with by all school officers of the State not later than the beginning of the next school year.

REGULAR MEETING, HELD AT LANSING, APRIL 8, 1910.

The members present were: President Angus McLean, M. D., Vice-President M. C. Sinclair, M. D., V. C. Vaughan, M. D., A. R. Wheeler, M. D., Charles M. Ranger, Charles A. Blake, and F. W. Shumway, M. D., Secretary.

The Secretary read the reports of the investigations made by the medical inspectors since the last meeting of the Board.

Dr. Shumway was appointed a delegate to represent this Board at the meeting of the State and Provincial Boards of Health to be held at Washington, D. C., April 28 and 29, 1910, also to attend the Eighth Annual Conference of the State and Territorial Health Authorities and the Public Health and Marine Hospital Service to be held at Washington, D. C., April 30, 1910.

AN ADJOURNED REGULAR MEETING, HELD AT LANSING, APRIL 9, 1910.

The members present were: President Angus McLean, M. D., Vice-President M. C. Sinclair, M. D., Aaron R. Wheeler, M. D., Victor C. Vaughan, M. D., Charles M. Ranger, Charles A. Blake and F. W. Shumway, M. D., Secretary.

The time of this meeting was taken up conferring with the representatives of the several railroad companies relative to ways and means of carrying out the provisions of the State law in regard to the sanitary conditions of railroad coaches, depots, etc.

EXAMINATION OF PLANS FOR STATE BUILDINGS.

During the fiscal year, in accordance with the provisions of Section 2229, Compiled Laws of 1897, plans for the following new buildings and additions to or alternations in existing buildings, in connection with State institutions, were examined by the State Board of Health and opinions offered thereon:

An Annex to the Botanical Building at the Michigan Agricultural College.—The plans were approved.

A new warming and ventilating plant for the Main Building at the Northern Michigan Asylum, Traverse City.—The plans were approved conditionally.

New Shacks, numbered 4 to 9, and new Pumping Station at the State Sanatorium, Howell.—With minor exceptions, the plans were approved.

New School Building at the Michigan School for the Blind, Lansing.—By reason of the lack of funds, the installation of the warming and ventilating apparatus and the plumbing fixtures was not contemplated in the plans, and the opinion of the Board upon the plans was, therefore, necessarily limited.

EXAMINATION AND LICENSING OF EMBALMERS.

Under the provisions of Act No. 132, Laws of 1903, three examinations were held during the fiscal year ending June 30, 1910, as follows:

Detroit, July 1, 2 and 3, 1909.

Sault Ste. Marie, October 15, 1909.

Lansing, November 17, 18 and 19, 1909.

Of the 63 persons examined, 47 were granted licenses.

Reciprocal licenses were granted in seven instances.

A statement of expenses incurred in the operation of Act 132, Laws of 1903, may be found on a subsequent page of Part I of this report.

The following letter, issued in November, 1909, will serve to show the scope of the embalmers' examinations, and the conditions to be complied with on the part of applicants for examination:

STATE BOARD OF HEALTH,

OFFICE OF THE SECRETARY, LANSING.

To the Funeral Directors and Embalmers.

GENTLEMEN:

You are hereby informed that a regular meeting of the State Board of Health, called for the purpose of conducting an embalmers' examination, will be held in the Senate Chamber, Lansing, November 17, 18 and 19, 1909. The examination will commence at 9 o'clock Wednesday morning, November 17.

Candidates will be required to take both *written* and *oral* examinations with demonstration on the cadaver. Oral examinations will be given in the order applications are received.

Some of the general subjects included in the written examinations, are:

- (a) Visceral anatomy and the circulation of the human body.
- (b) The nature, action, modes of action and comparative value of disinfectants.
- (c) The method of embalming and preparing bodies for transportation, also shipping rules.
- (d) How diseases are spread; the best method for the restriction of diseases, and bacteriology in relation to the spread of disease.
- (e) The signs of death and the manner in which it is determined.

Those who desire to take the examination at this time must fill out and return to the Secretary of this Board, the enclosed application blank, with an unmounted photograph of the applicant, signed in ink on the back, and properly certified to by a notary. A fee of five dollars must accompany the application. Remittances may be made by express or postoffice money order or by registered letter. *Personal checks cannot be used.*

Applications should be on file in this office *one week* before the date of examination.

Application must be made in the name of an individual, and not of a firm.

Applicant's name must be signed in full.

All applicants should read carefully Sections 3, 4 and 5 of the statute sent you herewith. In the examination, a rating of seventy-five per cent or better must be made by the applicant to secure a license.

By direction of the State Board of Health. (Signed) FRANK W. SHUMWAY,
Secretary.

GENERAL AND SPECIAL WORK IN THE OFFICE OF THE SECRETARY.

Much of the general work of the office naturally groups itself under three heads,—the collection of information, the compilation of information so collected, and the dissemination of such information as will be of service in the restriction and prevention of disease.

COLLECTION OF INFORMATION.

As the local health officer is the principal medium by which this Department may reach and instruct the public in matters pertaining to the prevention of sickness and deaths, the appointment, and the return of the names and postoffice addresses of the health officers, in each year, are matters of more than ordinary interest and importance.

In each year, it is often necessary to make a first, second and third request for information which will place this office in communication with the local health officers, and during the time which is thus used up in corresponding and waiting, an outbreak of a dangerous disease may begin and become widespread before this office can afford the usual assistance to the proper officials in the locality.

It should be said, however, that there is an increasing tendency to comply with the law in this particular, and local boards of health now generally act promptly and cooperate cordially with this Department for the suppression of disease.

Having established communication with the newly appointed local health officers, pamphlets and other publications which may aid them in their work, together with the usual blanks for reports of outbreaks of diseases in their locality, are mailed from this Department. In some instances, considerable correspondence is necessary to instruct the health officials how to properly care for sick and infected persons, and to make reports which will be of value in the compilations for the annual reports and other publications of this Department.

In addition to the collection of the usual information relative to outbreaks of dangerous communicable diseases in this State, special information, upon subjects of public interest and importance, is sometimes asked for and is usually cheerfully furnished by a large number of the health officers and other persons from whom the information is sought.

DISSEMINATION OF INFORMATION.

As stated in the preceding paragraph, each newly appointed health officer is supplied, by this Department, with information relative to his duties. This information is contained principally in a pamphlet entitled "Health Officers' Manual," and in pamphlets covering the principal points in the etiology and methods of restriction and prevention of each of the dangerous communicable diseases.

Upon the receipt of information relative to an outbreak of a dangerous communicable disease, in addition to the usual instructions and blanks for making the reports, there are mailed to the health officers a sufficient number of pamphlets, relative to the particular disease then present, for distribution to the families and immediate neighbors of the sick person. In this way, the people are educated as to their duty, under the law, and their cooperation with the local health officers often secured.

A pamphlet covering the law respecting nuisances, and containing information relative to their suppression, is published, and distributed among those persons directly interested, when a complaint of a nuisance is made to this Department.

A pamphlet, giving the law, and regulations of this Department, respecting the preparation and shipment of dead bodies, is published, and distributed among the licensed embalmers, railroad officials, and other persons interested in the transportation of the dead.

ANNUAL REPORTS.

About 2,500 copies of the annual report are published each year and about 2,400 copies are distributed among the following:

Members and Ex-Members of the State Board of Health; Local Health Officers; Secretaries of State, Territorial and Provincial Boards of Health; Sanitary Journal Exchanges; Library Exchanges; City Hospitals and Sanatoriums; Presidents and Secretaries of County Medical Societies; the State Library and the Secretary of State.

NEOSTYLE WORK.

An important method of disseminating information, which has been used very extensively by this Department, is the preparation, by the Rotary Neostyle, from time to time as occasion requires, of short articles, letters, etc., upon subjects of interest to the public, and their distribution to editors of newspapers in this State, to the leading sanitary journals, and to any person who may be especially interested, or who will print or use them for the benefit of others.

During the fiscal year 1910, neostyle work to the amount of 6,670 impressions was prepared, and a large portion of it mailed as soon as prepared. The principal subjects were:

- Circular letter to health officers relative to the new tuberculosis law.
- Circular letters relative to plans for State buildings.
- Reports of proceedings of the State Board of Health.
- Circular letter to railroad agents relative to list of licensed embalmers.
- Circular letter to anti-tuberculosis societies relative to the State Tuberculosis Exhibit.
- Circular letter to presidents of county medical societies relative to cancer pamphlets.
- Circular letter to licensed embalmers relative to changes in the transit permits.
- Circular letter accompanying placards on the "Resuscitation of the Apparently Drowned."
- Circular letter to health officers relative to communicable disease work.

PUBLIC HEALTH BULLETINS

During the fiscal year ending June 30, 1910, the principal subjects treated in the Quarterly Bulletin were as follows:

Third Quarter of 1909.—"The Playground as a Factor in School Hygiene," by G. E. Johnson, Pittsburgh; "Cancer, and How It May be Cured," by the Michigan Department of Health; "The Differentiation of Outbreaks of Typhoid Fever Due to Water, Milk, Flies and Contact," by Dr. John F. Anderson, Washington, D. C.; "A Sermon for Health Seekers," by Henry F. Cope; "The Cost of Tuberculosis in Michigan," from the report of the Michigan Association for the Prevention and Relief of Tuberculosis; "Alphabet for School Children in the Prevention of Tuberculosis," by Dr. S. Adolphus Knopf, New York; "The Cause of Typhoid Fever on the Farm," by Dr. Robert Leach, Mt. Sterling, Ohio; "Clams or Children—Which?" from the Bulletin Indiana State Board of Health; "For Your Health's Sake—Cash Value of Air," Hartford City Gazette; "Physical Diagnosis According to Mr. Dooley," American Medicine.

Fourth Quarter of 1909.—"Digest of Michigan's Tuberculosis Law," by the Michigan Department of Health; "Primer on Tuberculosis for School Work," by the Michigan Department of Health.

First Quarter of 1910.—"The Bacteriology of Diphtheria," by M. L. Holm, Ph. C., M. D., Bacteriologist Michigan State Board of Health; "The Evil

Influences of School Conditions upon the Health of School Children," by Woods Hutchinson, A. M., M. D., New York City; "Tuberculosis. What it is. The Opposition We Meet. What We Need. What We Hope to Accomplish," by Miss Ethel Williams, Hastings; "Tuberculosis Preventorium for Children," from the Journal Am. Med. Ass'n; "Nasal Obstructions; Why They are Dangerous to Children," by the Michigan Department of Health; "Dirty Hands," by R. G. Eccles, M. D., Brooklyn, N. Y.; "Physical Welfare Paramount," by J. E. McDonald, Deputy Secretary State Board of Health.

Second Quarter of 1910.—"Work of the State Board of Health," by M. C. Sinclair, M. D., Grand Rapids; "What the Practicing Physician can do in the Prevention of Typhoid Fever," by L. L. Lumsden, M. D., Washington, D. C.; "Instances of the Value of Preventive Medicine," from the Therapeutic Gazette; "Children's Diseases from an Economic Standpoint," by William F. Snow; "Epidemic Infantile Paralysis: What if it Should Come to Michigan," by Marion A. Spratt; "Ten Steps for the Protection and Physical Welfare of School Children," from the Washington, D. C., Herald; "Whooping-cough from the Point of View of Public Health," by Charles R. Grandy, M. D., Norfolk, Va.

Beginning with October, 1907, a monthly bulletin has been issued and mailed to health officers, newspapers, a selected list of physicians, the superintendent of State charitable, penal and reformatory institutions, members and ex-members of the State Board of Health, and Sanitary Journal Exchanges.

The monthly bulletin is designed, principally, to furnish to health officials and physicians information relative to the prevalence of the several dangerous communicable diseases in the State, but particularly in their immediate vicinity.

By a table in these bulletins, which shows the prevalence of the several diseases in each month of the year and in the average year, the time of the year when any disease may be expected to increase or decrease in prevalence may be noted in advance; and comparisons may be made of the prevalence of any disease in any two or more months in the same year, or between any month in the current year and the corresponding month in the average year.

Special mention is made in the bulletin each month of the disease which is usually most prevalent during the current month; and items of interest, which have an important bearing upon the public health, are inserted as space will permit.

Instructive diagrams, relating principally to the status of the several diseases, occupy the bulk of the front page of each issue of the bulletin.

PLACARDS ISSUED BY THIS DEPARTMENT.

The placards "What to do for the Drowned," were sent to the health officers and others throughout the state.

"Flies Poison Food," was the subject of a placard sent to the health officers with instructions to distribute them among certain business places.

Placards giving warning relative to spitting on sidewalks were sent to the health officers, station agents, factory superintendents and others, who in the opinion of this board, would post the placards in conspicuous places.

Placards relative to "Resort Sanitation" were sent to all summer resorts in the State.

SCHOOL WORK.

In compliance with Act No. 146, Laws of 1897, a copy of a special issue of the "Public Health, Michigan," Bulletin, known as the "Teachers' Edition," is mailed to each teacher and superintendent of the public schools in this State at the beginning of each school year. This manual contains the documents issued by this Department, on the restriction and prevention of nine of the dangerous communicable diseases, the document on "Disinfectants, their Relative Value and Uses," and a list of suggestive questions for teachers. In addition to this manual, each teacher and superintendent is supplied with a copy of each regular quarterly issue of the "Public Health, Michigan," Bulletin.

LOCALITIES VISITED BY THE STATE TUBERCULOSIS EXHIBIT DURING THE FISCAL YEAR 1909-1910.

During the fiscal year, upon request, the State Tuberculosis Exhibit was sent to the undermentioned localities and was productive of much good in each of the localities visited:

HOUGHTON, week ending September 25, 1909, in connection with the County Fair and under the auspices of the Houghton County Anti-Tuberculosis Society.

SAGINAW, October 25 to 30, 1909, in connection with the Michigan State Teachers' Association annual meeting and under the auspices of the local Anti-Tuberculosis Society.

GRAND RAPIDS, November 1 to 9, 1909, in connection with a Civic Exhibit.

HASTINGS, November 29 to December 8, 1909, under the auspices of the local Anti-Tuberculosis Society.

ANN ARBOR, December 11 to 21, 1909, under the auspices of the local Anti-Tuberculosis Society.

IRON RIVER, January 18 to 31, 1910, under the auspices of the School Board.

COLDWATER, June 2 to 14, 1910, under the auspices of the local Anti-Tuberculosis Society.

In each case, the cost of transportation of the Exhibit, and the traveling and other necessary expenses of the attendant, were defrayed by the locality. This was made necessary by the fact that there is no fund available for the payment of these expenses by the State.

INVESTIGATIONS MADE BY THE STATE MEDICAL INSPECTORS DURING THE FISCAL YEAR ENDING JUNE 30, 1910.

In addition to his attendance at the regular and special meetings of the State Board of Health and at the examinations of embalmers, which were held outside of the city of Lansing, the Secretary of this Board, as a medical inspector, together with others acting in the same capacity, under Act 293, P. A. 1909, made visits to the undermentioned localities for the purposes named:

ST. JOSEPH, JULY 15, 1909.—Investigation of an outbreak of scarlet fever, by Wm. DeLano, M. D., of Grand Rapids.

CALVIN TOWNSHIP, CASS COUNTY, JULY 17, 1909.—Investigation of an outbreak of smallpox, by Wm. DeLano, M. D., of Grand Rapids.

ADRIAN, JULY 19-20, 1909.—Raising quarantine and disinfecting the Industrial Home for Girls by F. W. Shumway, M. D., Secretary.

EATON RAPIDS, JULY 28, 1909.—Investigation of an outbreak of smallpox by Dr. F. W. Shumway.

NILES, AUGUST 4, 1909.—Investigation of an outbreak of smallpox by Dr. F. W. Shumway.

HOWELL, AUGUST 24, 1909.—Investigation of an outbreak of smallpox by Victor C. Vaughan, M. D., of Ann Arbor.

BERRIEN SPRINGS, AUGUST 16-17, 1909.—Investigation of an outbreak of smallpox by Malcolm C. Sinclair, M. D., of Grand Rapids.

MACATAWA PARK, SEPTEMBER 1, 1909.—Investigation of the water supply and the sanitary conditions of the Hotel Macatawa by F. W. Shumway, M. D.

RILEY TOWNSHIP, CLINTON COUNTY, SEPTEMBER 13, 1909.—Investigation of an outbreak of typhoid fever by F. W. Shumway, M. D.

GRAND HAVEN, SEPTEMBER 16, 1909.—Investigation of the water supply and cesspools and the sanitary conditions in and around the Highland Park Hotel by F. W. Shumway, M. D.

AKRON TOWNSHIP, TUSCOLA COUNTY, SEPTEMBER 28, 1909.—Investigation of a typhoid fever epidemic, in the mining district lying between Akron township and Fairgrove township, by J. T. Sample, M. D., of Saginaw.

BELDING, OCTOBER 19-20, 1909.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

STANDISH, NOVEMBER 3, 1909.—Investigation of an outbreak of smallpox by Aaron R. Wheeler, M. D., of St. Louis.

FLINT, NOVEMBER 15, 1909.—Investigation of a smallpox epidemic by M. C. Sinclair, M. D., of Grand Rapids.

MANCERONA, DECEMBER 18-19, 1909.—Investigation of an outbreak of smallpox by Thomas M. Koon, M. D., of Grand Rapids.

LEWISTON, DECEMBER 20, 1909.—Investigation of an outbreak of smallpox in camps near Lewiston by Thomas M. Koon, M. D., of Grand Rapids.

CARO, DECEMBER 27, 1909.—Inspection of an alleged nuisance at the Caro sugar factory by M. L. Holm, M. D., State Bacteriologist.

BLISSFIELD, JANUARY 4, 1910.—Inspection of an alleged nuisance at the Blissfield sugar factory by M. L. Holm, M. D., State Bacteriologist.

OWOSSO, FEBRUARY 1, 1910.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

BENNINGTON, FEBRUARY 1, 1910.—Investigation of an outbreak of smallpox by Dr. F. W. Shumway.

LAPEER, FEBRUARY 16, 1910.—Investigation of an outbreak of smallpox by Dr. F. W. Shumway.

BATTLE CREEK, FEBRUARY 18, 1910.—Investigation of an outbreak of smallpox by Dr. F. W. Shumway.

MONROE, FEBRUARY 25, 1910.—Investigation of an outbreak of scarlet fever by Guy L. Keifer, M. D., of Detroit.

OWENDALE, MARCH 17, 1910.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

GAGETOWN, MARCH 17, 1910.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

HARRISON, MARCH 18, 1910.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

CLARE, MARCH 18, 1910.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

ARTHUR TOWNSHIP, CLARE COUNTY, MARCH 23, 1910.—Investigation of an outbreak of smallpox by Frank R. Gray, M. D., of Clare.

MONTROSE, MARCH 28, 1910.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

BAY CITY, APRIL 15, 1910.—Investigation of an epidemic of smallpox by M. L. Holm, M. D., State Bacteriologist.

BROOKFIELD TOWNSHIP, EATON COUNTY, MAY 16, 1910.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

GRAND RAPIDS, MAY 17, 1910.—Investigation of an alleged nuisance by F. W. Shumway, M. D.

PONTIAC, MAY 24, 1910.—Investigation of an outbreak of diphtheria by F. W. Shumway, M. D.

CALUMET TOWNSHIP, JUNE 1-7, 1910.—Investigation of a case of leprosy by F. W. Shumway, M. D.

PETOSKEY, JUNE 9, 1910.—Investigation of an outbreak of scarlet fever by F. W. Shumway, M. D.

ARCADA TOWNSHIP, GRATIOT COUNTY, JUNE 10, 1910.—Investigation of an outbreak of smallpox by A. R. Wheeler, M. D., of St. Louis.

NEW HAVEN TOWNSHIP, GRATIOT COUNTY, JUNE 10, 1910.—Investigation of an outbreak of smallpox by A. R. Wheeler, M. D., of St. Louis.

NEWARK TOWNSHIP, GRATIOT COUNTY, JUNE 10, 1910.—Investigation of an outbreak of smallpox by A. R. Wheeler, M. D., of St. Louis.

OWOSSO, JUNE 24, 1910.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

DURAND, JUNE 24, 1910.—Investigation of an outbreak of smallpox by F. W. Shumway, M. D.

WAYNE, JUNE 27, 1910.—Investigation of an outbreak of smallpox and the inspection of pollution of the River Rouge by F. W. Shumway, M. D.

The investigations made by the Sanitary Engineer, as a medical inspector, will be found under the caption "Report of Work in the Division of Sanitary Engineering During the Fiscal Year Ending June 30, 1910."

REPORT OF WORK IN THE DIVISION OF SANITARY ENGINEERING DURING THE FISCAL YEAR ENDING JUNE 30, 1910.

Much of the work in this Division is carried on by correspondence and, occasionally, by telephone, detailed statements of which cannot be given in this report for lack of space.

One line of work in which the Sanitary Engineer was engaged quite extensively during the fiscal year was the enlargement of the Michigan Tuberculosis Exhibit, and the installation of the Exhibit, for educational purposes, in a number of localities in the State, particulars of which may be found on a preceding page.

Another line of work which, for many years past, has been referred to this Division is the preliminary examination of the plans for buildings at State Institutions submitted to the State Board of Health under the provisions of Section 2229, Compiled Laws of 1897, and the preparation of reports thereon for the guidance of the Board in making the official examination of the plans. A statement relative to the examination of such plans during the fiscal year may be found on a preceding page.

But what is considered to be the most important line of work in this Di-

vision is the visits which are made by the Sanitary Engineer, acting as a State Medical Inspector under the provisions of Act No. 293, Public Acts of 1909, to localities in the State for the purpose of conferring with and giving assistance to the local authorities in matters pertaining to the health of the people, with special reference to the questions of water supply; sewerage, and other methods of removal and disposal of excreta and waste matters; and the warming, ventilation, and general sanitation of schoolhouses and other buildings of a public character. A list of the localities visited by the Sanitary Engineer during the fiscal year follows:

LOCALITIES VISITED BY THE SANITARY ENGINEER, AND THE PURPOSES
FOR WHICH THE VISITS WERE MADE, DURING THE FISCAL YEAR
1909-1910.

WEST BAY CITY, JULY 13, 1909.—Investigation relative to the methods of disposing of the beet pulp from the plant of the West Bay City Sugar Company.

FREMONT, JULY 20, 1909.—Investigation relative to a nuisance from the discharging, into Fremont Lake, of the village sewage and the wastes from the Fremont Canning Company and the Fremont Leather Company.

NORTH LANSING, JULY 23 AND 26, 1909.—Investigation relative to the possibility of contamination of the water in a new well at the city pumping station.

WYANDOTTE, AUGUST 4, 1909.—Investigation relative to a proposed plan for the purification of the city water supply.

BELDING, AUGUST 13, 1909.—Investigation relative to the possibility of contamination, by a slaughter-house, of the pond from which the ice supply of the city is harvested.

FLINT, AUGUST 16, 1909.—Investigation relative to the sources of typhoid fever in the city.

TECUMSEH, AUGUST 19, 1909.—Investigation relative to the possibility of nuisance from the discharging of sewage into the Raisin river.

VASSAR AND CARO, NOVEMBER 18 AND 19, 1909.—Investigation relative to a nuisance from the discharging into the Cass river of the sewage from the plant of the Michigan Sugar Company at Caro.*

CARO, DECEMBER 27 AND 28, 1909, AND BLISSFIELD, JANUARY 4, 1910.—To assist the State Bacteriologist in an investigation relative to the nature of the waste water, and the best methods for its disposal, from the sugar factories at these places.*

GERMANY, JANUARY 26 TO MARCH 24, 1910.—Investigation relative to the methods of disposal of the wastes from beet sugar factories in that country.*

PAW PAW, APRIL 13, 1910.—Investigation relative to the contamination, by sewage, of a lake which is partly in the village and partly in Paw Paw township.

HARTFORD, APRIL 14, 1910.—Investigation relative to the methods of disposing of sewage in the village.

HOWELL, APRIL 20, 1910.—Inspection of six new shacks, and investigation relative to a proposed drain for the sewage purification plant, at the State Sanatorium.

SAGINAW, MAY 13, 1910.—Conference of attorneys of the Michigan Sugar

*The report upon this investigation is printed in the report on "The Disposal of Sewage from Beet Sugar Factories," on subsequent pages.

Company and the Village of Vassar with the Attorney General, relative to the disposal of sewage from the sugar factory at Caro.*

GRAND BLANC, MAY 21, 1910.—Inspection of the warming and ventilating plant at the schoolhouse.

BLISSFIELD, JUNE 6, 1910.—Conference with officials of the Continental Sugar Company relative to proposed plans for the disposal of sewage from the sugar factory at that place.*

CARO, JUNE 17, 1910.—Conference with officials of the Michigan Sugar Company relative to proposed plans for the disposal of sewage from the sugar factory at that place.*

DEWITT, JUNE 29, 1910.—Inspection of the warming and ventilating plant of the schoolhouse.

Respectfully submitted,
(Signed) THOS. S. AINGE,
Sanitary Engineer and Acting State Medical Inspector.

THE DISPOSAL OF SEWAGE FROM BEET SUGAR FACTORIES.

In past years, at irregular intervals, the question of the disposal of sewage from beet sugar factories in Michigan has been brought to the attention of the State Board of Health, and, at such times, investigations, mostly superficial in character, have been made. It was not, however, until the fiscal year 1909-1910 that anything approaching an exhaustive investigation of this question was attempted or any radical changes made in the methods of disposing of the sewage, particulars of which follow. Much of the credit for the valuable knowledge which has been gained from these investigations relative to the composition of the liquid wastes, commonly designated sewage, from the beet sugar factories; the changes which take place in the sewage, under varying conditions, when in the rivers and other watercourses into which it is usually discharged; and the methods of treating such sewage before it is discharged into a natural watercourse to avoid the creation of a nuisance therefrom, must be given to Dr. M. L. Holm, State Bacteriologist, copies of whose reports upon this question follow. In this connection, it should be stated that, during the fiscal year 1909-1910, presumably due to the publicity given to the subject in connection with the investigations at Caro and Blissfield, improved methods for taking care of the waste products have been instituted in connection with several sugar factories in this State other than those mentioned in this report.

INVESTIGATION RELATIVE TO AN ALLEGED NUISANCE FROM CASS RIVER AT VASSAR.

Upon the request of the village authorities, on November 18, 1909, the Sanitary Engineer went to Vassar and made an investigation relative to an alleged nuisance from the Cass river which was said to be due to the wastes from the plant of the Michigan Sugar Company at Caro. The following is extracted from the report upon this investigation:

The village authorities of Vassar, who are the complainants, allege that, during the latter part of October and the first two weeks of November, the stench from the river where it passes through the village of Vassar was at times intolerable, and compelled the residents

*The reports upon these investigations and conferences are printed in the report on "The Disposal of Sewage from Beet Sugar Factories," on subsequent pages.

*The report upon this conference is printed in the report on "The Disposal of Sewage from Beet Sugar Factories," on subsequent pages.

of that portion of the village which is adjacent to the river to keep doors and windows closed during the warm days. They also allege that thousands of dead fish were observed in and on the banks of the river as early as November first, and that fish, in large numbers, had been dying in the river above the village since that time, of which I had abundant evidence during a ride up the river on the day of my arrival in company with F. C. Hogle, President of the village; R. D. Varnham and J. W. Smith, members of the village Council; Dr. L. J. Gibson, Health Officer of the village; and J. A. Trotter, Postmaster and Publisher of the Tuscola County Pioneer. The dead and dying fish were the most numerous about four miles above the village; and the river, both at and above the village, showed undoubted evidence of contamination by the wastes from the sugar factory at Caro, as may be gleaned from the accompanying report of Dr. M. L. Holm, State Bacteriologist, upon the samples of river water submitted to him by me for analysis, particulars of which follow.

By reason of the rain storm of November 16 and the subsequent high winds and cold weather, the condition of the river had evidently been greatly improved as no objectionable odors from the river were detected by me during my stay in the village.

On November 19, in company with F. C. Hogle, President of Vassar village and E. J. Thrasher, Deputy State Game Warden, I went to Caro and made an inspection of the manner of disposing of the wastes from the sugar factory. It was found that the sewage from the factory was passing through large settling basins before it entered the river; and that the wastes containing lime were passing into separate settling basins, of sufficient capacity, so I was informed by the Superintendent of the factory, to hold the accumulated wastes of this description during the entire season's operations and so prevent the same from gaining access to the river.

There was no objectionable odors discernable at the plant of the Sugar Co., except where the sewage from the settling basins entered the river.

On November 19, I obtained samples of water and sewage from the following points and, on the following day, submitted them to the State Bacteriologist for analysis:

Sample No. 1 from the outlet of the settling basins of the sugar factory.

Sample No. 2 from the outlet of the sewer of the sugar factory.

Sample No. 3 from the Cass river about one-half mile above the outlet of the settling basins of the sugar factory.

Sample No. 4 from the Cass river at the village of Vassar.

A report of the analyses of the foregoing samples is attached hereto:

Report of the State Bacteriologist upon the four samples of water collected at Caro and Vassar by the Sanitary Engineer on November 19, 1909.

RESULTS OF ANALYSES.				Sample No. 1.	Sample No. 2.	Sample No. 3.	Sample No. 4.
Color.....				Dark	20	20	40
Odor.....				H ₂ S	Beet	Musty	Sweetish, musty
Turbidity.....				Marked	Marked	Slight	Marked
Sediment.....				Black	Considerable	Trace	Considerable
				4.000	4.500	.030	.500
				3.750	6.250	.140	.450
				.000	.000	.000	.015
				.000	.000	.400	.050
				4.000	11.000	9.000	9.000
				15.400	14.000	1.500	1.500
				101.000	109.000	12.500	17.100
				23.400	25.400	2.000	2.000
				310.000	200.000	200.000	240.000
				375.000	300.000	300.000	230.000
				295.000	530.000	210.000	195.000
				2.000	5.000	.600	.600
				5.100	.000	.000	.000
				10.200	8.000	.000	.000
				1,500,000	2,000,000	2,500	4,500
				75,000	100,000	160	1,800
Colonies per cc at room temperature.....				20%	18%	None	22%
Colonies per cc at incubator temperature.....				22%	15%	None	18%
Presumptive tests for B. Coll.....				18%	25%	22%	35%
Gas Production on Lactose B.....				30%	20%	30%	30%
1-100 cc.....				Marked	Marked	Marked	Marked
1-10 cc.....				Marked	Marked	Marked	Marked
25 cc.....				Marked	Marked	Marked	Marked
Acidity.....				Present	Present	Present	Present
Turbidity.....				40,000	60,000	2	1,000
Indol production.....				Present	Present	Present	Present
Red colonies on L. L. A.....				MARKED	MARKED	NONE	NONE
B. Coll.....							
PUTRESCIBILITY.....							

A detailed interpretation of these findings can hardly be given in this brief report, but a broad general interpretation is necessary in order to make the report intelligible to anyone not a skilled biological chemist. The river above Caro is contaminated with material largely of vegetable origin, but some contamination of animal origin is also present and the water could not be considered safe for drinking purposes. This contamination is found to be enormously increased at Vassar, and the findings indicate conclusively that the increased contamination at Vassar is essentially traceable to the sugar factory.

The material discharged from the outfall of the sewer just below the sugar factory is highly charged with bacteria and organic matter without sufficient available oxygen to prevent putrefaction. The settling basin may be said to serve merely as an incubator, where the bacterial activity is enormous and the factory refuse is converted from the fresh material into a mass of putrefactive filth. In our results that process was duplicated by incubating anaerobically material from the outfall of the sewer, which was found after 48 hours to be worse than the original sample taken from the outfall of the settling basin.

It is not possible to give in detail all the injurious and toxic products that are formed in this process of anaerobic bacterial decomposition. The gases formed convert the surrounding atmosphere into what is generally known as sewer air, possessing all of those characteristic properties both as regards gross nuisance and injury to health.

The hydrogen sulphide is a distinct animal poison in itself being very nearly as toxic as prussic acid. The stench at Vassar is probably directly as well as indirectly traceable to this beet refuse. Directly, by the putrefying products being emptied into the river and this process will be continued down the stream perhaps largely as anaerobic bacterial changes in the sediment below the plant at the bottom of the river. Our experiments show that even in the sample collected from the outfall or settling basin, putrefaction is not nearly complete. Indirectly this beet refuse may be the cause of nuisance at Vassar by destroying animal life in the water. This product is not only a direct poison to fish by virtue of the hydrogen sulphide it contains, but the power to absorb oxygen both in hot and cold solution is enormous, as seen in our figures, and it is well known that fish cannot long survive in a water without a sufficiency of free oxygen.

How this condition should be remedied, we are not prepared to suggest at the present time. But if this discharge must enter the river, it must be supplied with the necessary oxygen or it will continue to be a nuisance. In the presence of sufficient available oxygen, no anaerobic products will be formed, hydrogen sulphide and other putrefactive products will no longer appear and after proper oxidation this refuse should no longer be either direct or indirect cause of nuisance. It should be remembered, however, that the material already on the bottom of the river may continue to cause some trouble for a considerable period.

November 24, 1909.

(Signed)

M. L. HOLM, M. D.,
Bacteriologist.

INSPECTION OF THE PLANTS OF THE MICHIGAN SUGAR COMPANY, AT CARO, AND OF THE CONTINENTAL SUGAR COMPANY, AT BLISSFIELD.

In accordance with the request of Hon. J. E. Bird, Attorney General, on December 27, 1909, the Sanitary Engineer and the State Bacteriologist went to Caro and made a careful study of the methods of disposing of the wastes from the plant of the Michigan Sugar Company.

On the morning of December 28, samples of waste water were taken from different points in the plant for analyses and for comparison with the results of analyses of samples taken from other points in the plant by the Sanitary Engineer on November 19, particulars of which may be found on a preceding page. The results of the analyses of and experiments with the samples taken on December 28, and of samples of water and lime wastes subsequently furnished by the Manager of the plant, are contained in the report of the State Bacteriologist appended hereto.

On the afternoon of December 28, a visit was made to the village of Vassar for the purpose of conferring with the village authorities relative to the condition of the Cass river since the visit of the Sanitary Engineer in November.

On January 4, 1910, a visit was made to the plant of the Continental Sugar Company, at Blissfield, and a careful study was made of the methods of disposing of the wastes from that plant. A sample of water was taken

from the pulp silo and analyzed in the Laboratory of this Department, the results of which are contained in the report of the State Bacteriologist appended hereto. Had the plant been in operation at the time of the visit, samples of sewage, and of the river water above and below the sewer from the factory, would have been taken, as at Caro. It is believed, however, that the results of the analyses of such samples would have been about the same as in the case of the samples taken at Caro.

The following is extracted from the report of the State Bacteriologist upon the investigations at Caro and Blissfield:

Report of the State Bacteriologist Upon the Wastes From the Sugar Factories at Caro and Blissfield.

At the time of this investigation, the Blissfield Sugar Factory was not in operation, so very little opportunity was given for the study of discharges at that place. The factory at Caro was in full operation and said to be discharging into the river about 5,000,000 gallons of waste water daily. This waste upon examination was found to contain about 1-10% of organic material, which constitutes the waste from about 1,000 tons of sugar beet, which amount is said to be the daily capacity of the plant. This material is partly in solution and partly in suspension, being derived wholly from the sugar beet and is free from any constituent not present either in or on the beets as received at the factory or contained in the normal river water used.

Claassen states, "The waste waters from a sugar factory are not injurious to the health of man or beast. They are not of themselves directly injurious to the fish in the streams," but under certain conditions of decay may "Generate so much hydrogen-sulphide gas that all of the fish may be killed."

This statement is well borne out by our findings. We are, however, confronted with a problem of considerable magnitude which is better appreciated when we consider the waste from the Caro factory contains about twenty tons of organic matter in every 24 hours discharge. According to scientific investigations, this would equal the organic wastes from the discharges of over 200,000 people. Like domestic sewage, this material readily undergoes decomposition. It contains about the same amount of organic matter, but it differs from domestic sewage in that it contains a larger proportion of carbohydrates and less protein, thus requiring somewhat more oxygen for its purification. It differs also from domestic sewage in that it is not likely to contain any specific bacteria of disease. This fact is of importance inasmuch as it renders the material harmless whenever sufficiently diluted to prevent anaerobic decomposition, and if the receiving stream does not furnish sufficient water for this dilution the same results may be obtained by partial purification.

It is evident from the complaints made by the people below several of the sugar factories that the rivers upon which they are located at times do not furnish sufficient water to prevent gross nuisance from the sugar factory wastes. It is only when these wastes undergo bacterial decomposition in the absence of oxygen that offensive gases are given off. Thus whether the chief cause of the destruction of animal life in the water is the lack of oxygen or the gases formed does not materially affect our conclusions, nor does the effect of sugar factory wastes upon fishes require more than a passing notice, for the same remedy which will prevent nuisance will undoubtedly prevent the destruction of fishes.

The amount of purification required for the wastes from various sugar factories must be determined by considering the average daily discharge and the lowest volume of stream flow.

Pettenkofer concluded from the investigations on the River Isar, at Munich, that if the sewage never amounts to more than 1-15th of the river water, the raw sewage may be poured into the river without causing nuisance.

Prof. Long determined that about 1-17th crude Chicago sewage mixed with Lake Michigan water in the Illinois River would not cause nuisance.

Stearns, engineer to the Massachusetts Board, concluded that if the sewage averaged more than 2.5% of 1-40th of the river water it could not be discharged into the river in its raw state.

The exact amount of sewage which a given stream will take care of varies greatly with conditions and no absolute rule can be laid down. Thus a discharge which decomposes rapidly may rob a large amount of water of its oxygen and create nuisance, while material decomposing more slowly would give more time for aeration and perhaps cause no trouble. For the same reason a nuisance is less likely to be created in cold weather than during the warmer season. The depth, rate of current, falls, and character of the water are likewise

important. The introduction of dams causes a certain amount of water to become stagnant and hinders oxygenation, thus favoring anaerobic decomposition. That a river which has become polluted may subsequently undergo self purification is proven beyond doubt, but the distance required for such purification varies so enormously with conditions that it cannot be even approximated in a general statement.

The wastes from the factory come from five sources approximately as follows:

1. Carriers, } 4,600,000 gallons.
2. Scrubbers, }
3. Diffusion Battery, 300,000 gallons.
4. Pulp Presses, 80,000 gallons.
5. Lime waste, 20,000 gallons.

Of these, only the first four are discharged directly into the river. The lime waste is not discharged into the river. Samples collected from above mentioned wastes gave the following results upon analysis:

	1.	2.	3.	4.	5.
N. as Free Ammonia.....	4.50	5.00	4.00	4.00	5.00
N. as Alb. Ammonia.....	7.00	20.00	14.20	35.00	140.00
N. as Nitrites.....	0.00	0.03	0.00	0.00	0.05
N. as Nitrates.....	0.00	Trace	0.00	0.00	Trace
Chlorine.....	14.00	14.00	14.00	14.00	20.00
Alkalinity M. O.....	125.00	50.00	100.00	100.00	70,000.00
Alkalinity Phth.....	0.00	0.00	0.00	0.00	600.00
Total solids.....	2,600.00	5,475.00	2,065.00	2,780.00	.....
Mineral.....	640.00	1,395.00	545.00	590.00	.....
Organic.....	1,960.00	4,080.00	1,520.00	2,190.00	.....
Oxygen consumed.....	420.00	1,200.00	1,850.00	850.00	2,200.00

Results obtained after straining.

	1.	2.	3.	4.	5.
N. as Free Ammonia.....	4.50	5.00	4.00	4.00	5.00
N. as Alb. Ammonia.....	3.00	12.00	5.40	18.50	15.00
Alkalinity M. O.....	.....	.....	.....	.....	440.00
Alkalinity Phth.....	.....	.....	.....	.....	105.00
Total solids.....	1,300.00	4,030.00	980.00	2,080.00	.....
Mineral.....	600.00	780.00	405.00	500.00	.....
Organic.....	700.00	3,250.00	575.00	1,580.00	.....
Oxygen consumed.....	350.00	1,000.00	200.00	600.00	1,040.00
Organic matter removed.....	1,260.00	1,830.00	945.00	610.00	.....

A sample of mixed waste from the sewer outfall gave the following results:

	Unstrained.	Strained.
N. as Free Ammonia.....	2.00	2.00
N. as Alb. Ammonia.....	7.00	5.00
N. as Nitrates.....	0.00	0.00
N. as Nitrites.....	0.00	0.00
Chlorine.....	14.00	14.00
Alkalinity.....	180.00	180.00
Total solids.....	2,250.00	1,280.00
Mineral.....	1,250.00	540.00
Organic.....	1,000.00	740.00
Oxygen consumed.....	280.00	248.00

From the above figures it will be observed that about 75% of the mixed organic discharge is either in solution or finely suspended and cannot be removed by screening or sedimentation, the remaining 25% may be mostly removed by screens.

In considering the various wastes, screening would have most effect on the diffusion battery wastes from which about $\frac{2}{3}$ of the organic material could be removed by this process. The press water contains a great deal of material in a finely suspended state which cannot be removed by screening. But even here a fine screen would eliminate nearly $\frac{1}{2}$ of the organic matter. While much of the material in the water from the carriers and scrubbers could be removed by screening, the amount which cannot be so removed is considerable, and it is not probable that any of the above mentioned wastes may be looked upon as less dangerous than others.

While the wastes from the scrubbers, diffusion batteries and presses appear quite concentrated, it should be borne in mind that the carriers furnish the great bulk of the waste water, and, though less concentrated, probably by far the greatest amount of organic material, at least this is true while operating upon frozen beets.

It will be observed that the mixed sewage contains less organic matter than any of the samples collected at different points in the factory. We cannot account for this extra dilution only at the carriers, our sample being collected while the carriers were in motion and the water well stirred up. It is quite probable that when the carriers are not in motion only very little organic matter is taken up by the water.

The factory at Blissfield operating upon about 800 tons of beets daily would probably discharge proportionately the same amount of organic material from the carriers and scrubbers but here the sliced beets go from the diffusion batteries to a silo, from which the water drains into the main sewer. In this silo the pulp undergoes fermentation and a certain amount of carbohydrate becomes soluble through inversion and some acid albumin is formed. A sample collected at the time of our visit gave the following results:

Color.....	Faint yellow
Odor.....	Sour
Reaction.....	Acid
N. as Free Amm.....	35.00
N. as Alb. Amm.....	75.00
N. as Nitrites.....	.00
N. as Nitrates.....	.00
Total solids.....	6,600.00
Mineral.....	865.00
Organic.....	4,735.00
Oxygen consumed.....	1,900.00

When this material was treated with lime, about one half of the proteid material could be precipitated. This sample at the time of collection was undoubtedly much more concentrated than is the average drainage while the factory is in operation, but the composition is nevertheless illustrative of the nature of the discharge.

These various discharges, with exception of the lime, were very high in bacterial content. The lime waste was relatively low in bacteria but by no means germicidal or even markedly antiseptic.

Putrescibility tests were made upon all samples in order to determine which might be

the chief cause of nuisance. All samples in their undiluted state would completely exhaust all free oxygen in a few hours. After the oxygen was exhausted, the lime of bacterial activity seemed to depend largely upon the carbohydrate concentration. Those samples high in carbohydrates would ferment and become sour and the acids thus formed prevented subsequent putrefaction. By neutralizing with carbonate of lime, the normal alkalinity could be restored, after which putrefaction became rapid with much hydrogen sulphide formation. Thus, the samples from the carrier and diffusion battery readily underwent putrefactive decomposition. The sample from the scrubbers soured quickly and putrefied only after being repeatedly neutralized, which was also true of the sample from the press water. When diluted $\frac{1}{3}$ with common water, however, both of the last mentioned samples readily putrefied.

It has been suggested that by mixing a certain amount of lime with sugar factory refuse, decomposition may be retarded, thus abating the nuisance. A few experiments were carried out in our laboratory to determine if possible the effect of mixing the lime waste with the other discharges from the factory. The amount of lime thus furnished was found to be too small to have any antiseptic action. On the contrary, this amount of lime, by neutralizing the products of fermentation, very materially hastened the decomposition. When 5% or above of the lime waste could be mixed with the factory discharge, sedimentation was not only materially increased but putrefaction was distinctly retarded. From this it might seem possible that by mixing the lime waste with the other factory wastes in the settling tanks, the lime would not only aid sedimentation, but by neutralizing fermentation products would hasten the destruction of organic matter in solution and to some extent inhibit putrefaction in the bottom of the tanks where the lime would tend to accumulate.

SUMMARY OF CONCLUSIONS.

1. The nuisance caused below the factories at Caro and Blissfield is caused by the decomposition of sugar factory wastes.

2. The material discharged into the river consists of parts of sugar beets which are in no way injurious in themselves. But in the absence of sufficient oxygen, undergo putrefaction, thus giving rise to very disagreeable phenomena.

3. Beet particles and extractive are contained in all of the discharges, hence all of the discharges contribute to the formation of nuisance.

4. The waste water contains more organic material when operating upon frozen beets than when operating upon fresh beets.

5. About 25% of the organic matter may be removed by screening, the remaining portion will require fractional purification proportionate to the ratio of the total quantity of discharge to the volume of stream flow.

6. The lime waste may prove a valuable aid in purifying the other discharges and in the quantity used can produce no injurious results by being discharged together with the other wastes.

January 18, 1910.

(Signed)

M. L. HOLM, M. D.,
Bacteriologist.

INVESTIGATION OF THE METHODS OF DISPOSING OF THE WASTES FROM BEET SUGAR FACTORIES IN GERMANY.

As a result of a conference of officials and attorneys of the Michigan Sugar Company, of Saginaw, and the Continental Sugar Company, of Cleveland, Ohio, with Attorney General John E. Bird and representatives of the State Board of Health and the State Dairy and Food Department, held in Lansing, in December, 1909, the Sanitary Engineer of the State Board of Health was selected to go to Germany for the purpose of studying the methods of disposing of the wastes from beet sugar factories in that country, to the end that the State officials of Michigan might be in a position to stipulate what disposition should be made of the wastes from sugar factories in this State, with special reference to the factories at Caro and Blissfield, to prevent nuisance therefrom. The investigation was necessarily conducted during the month of February, 1910, at the time the sugar factories were not in operation and, for this reason, there was no opportunity to observe the effects of the disposal of waste matters from the factories upon the rivers

into which the sewage was discharged and upon the atmosphere in the vicinity of the disposal plants of the factories. The Sanitary Engineer was accompanied on his tour of investigation by Mr. W. H. Wallace, General Manager of the Michigan Sugar Company; Mr. Carl Sieland, Superintendent of the sugar factory at Caro; and Mr. Thomas Jackson, of the firm of Jackson & Church, manufacturers of beet sugar machinery, Saginaw. The following is extracted from the report of the Sanitary Engineer upon the trip under consideration:

Early in my investigation, in company with Mr. Ernest Grotkass, of Magdeburg, one of the leading dealers in sugar beet seed and who very kindly acted as interpreter on this occasion. I visited Herr Hirsch, State and Privy Counsellor, Chief of the Department of Industrial Inspection of the Province of Saxony, and interviewed him upon the subject of beet sugar factory sanitation. Herr Hirsch has held his present official position for more than twenty years and has about seventy beet sugar factories under his jurisdiction, and he was, therefore, in a good position to give me much information relative to what has been and is being done in regard to the disposal of the wastes from beet sugar factories, and to direct me to those plants which would be the most likely to furnish information which would be of service to the State of Michigan. From this interview it was learned:

That a general plan for the sanitary disposal of the liquid wastes from beet sugar factories has not been worked out in Germany.

That some years ago, Herr Von Boettcher, Ober President of the Province of Saxony, tried to govern the disposal of the wastes from beet sugar factories by means of general regulations but found the plan impracticable.

That while some of the settling basins and other places into and through which the liquid wastes from the beet sugar factories flow smell quite badly at times, very few complaints are received; and that, in dealing with such complaints, owing to the importance of the industry, the government officials act with the utmost conservatism so as not to unduly hamper the industry.

That sugar factory owners are not permitted to allow the beet pulp to accumulate upon their premises, and must dry or remove the same, or arrange for its removal to the place where it is intended for use, as fast as it is produced. This rule is rigidly enforced.

At a later date, after visiting a number of sugar factories and other establishments allied to the beet sugar industry, in the vicinity of Magdeburg, I had an interview, through an interpreter, with Goheimer Regierungsrat Dr. Kerp, Direktor in Kaiserlichen Gesundheitsamt, at Charlottenberg, near Berlin, relative to what had been done or learned by the Imperial Board of Health in regard to beet sugar factory sanitation. Dr. Kerp substantiated what I had learned from Herr Hirsch, of Magdeburg, and stated further that before any sugar factory can be established in the German Empire a description of the proposed method of disposing of the waste products must be laid before the proper authorities of the Province in which the factory is to be located and their approval obtained thereon. Dr. Kerp further stated that the Imperial Board of Health has not made any scientific investigations, neither have they records of any such investigation having been made in Germany, relative to the disposal of the liquid wastes from beet sugar factories. Dr. Kerp further stated that, as the sugar factories are usually located in the vicinity of villages where practically the entire farming population live, and where the farm animals, with the attendant manure piles, are kept in close proximity to the dwellings, the odors from a sugar factory would not be expected to be a source of complaint on the part of those who would be subjected to such odors.

The following description and illustrations of some of the beet sugar factories visited by me are representative of beet sugar plants in general in Germany, and also represent the most approved methods of dealing with the wastes from such factories in that country. For convenience, these factories may be divided into two classes, viz., those which are located near to rivers of considerable size, or which have a nearly uniform flow, and those located near to rivers or streams with a small average flow.

CLASS I. Where a factory is located on a river which has sufficient volume of water for the daily needs of the factory, the water which is used for carrying the beets into the factory and for washing the beets is usually discharged continuously into the river after it has passed through proper screening devices and through a settling basin of the ordinary type. Photographs of such a settling basin are shown in Exhibits A. and B., but in this case a departure has been made from the ordinary by the passing of the waste water over lumps of quicklime before it reaches the settling basin. The lime is placed in the outlet of the sewer from the factory, shown by the X in Exhibit B. and on a larger scale in Exhibit C. Tests for alkalinity of the waste water in this settling basin are made at irregular intervals. The reason for using quicklime for this purpose is that there is a very great

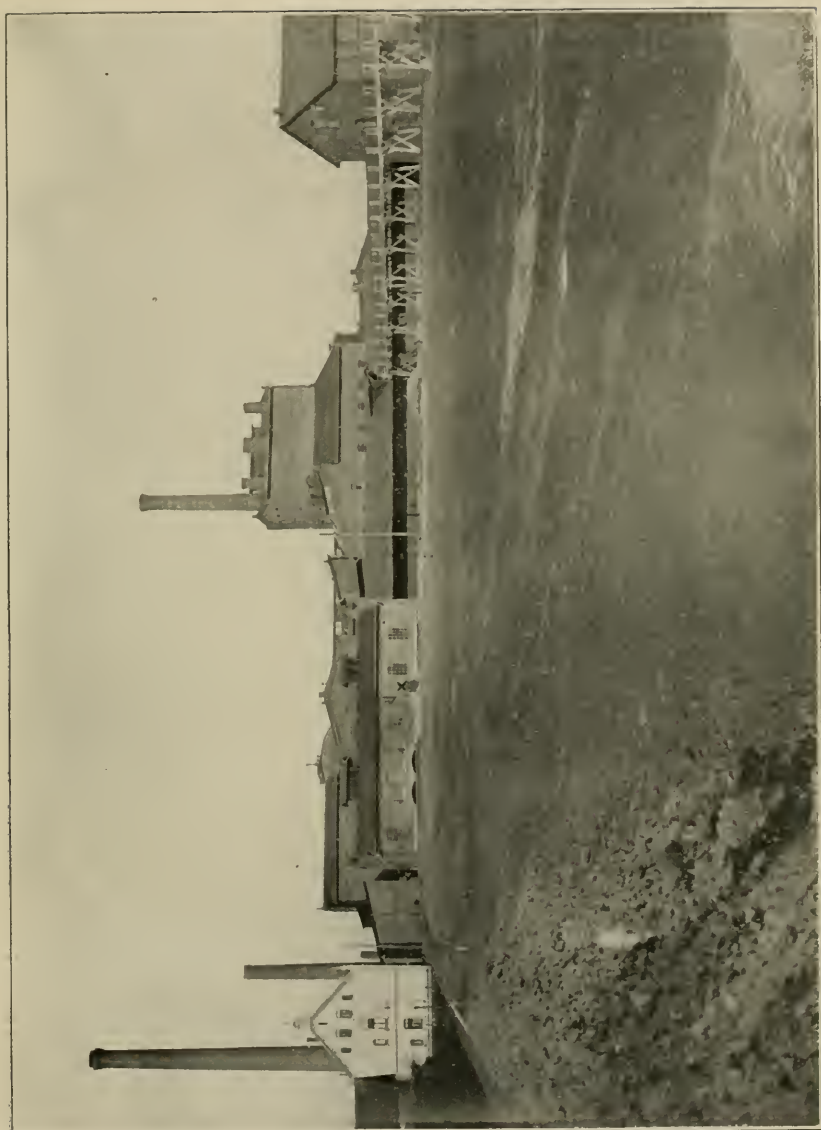


EXHIBIT A.

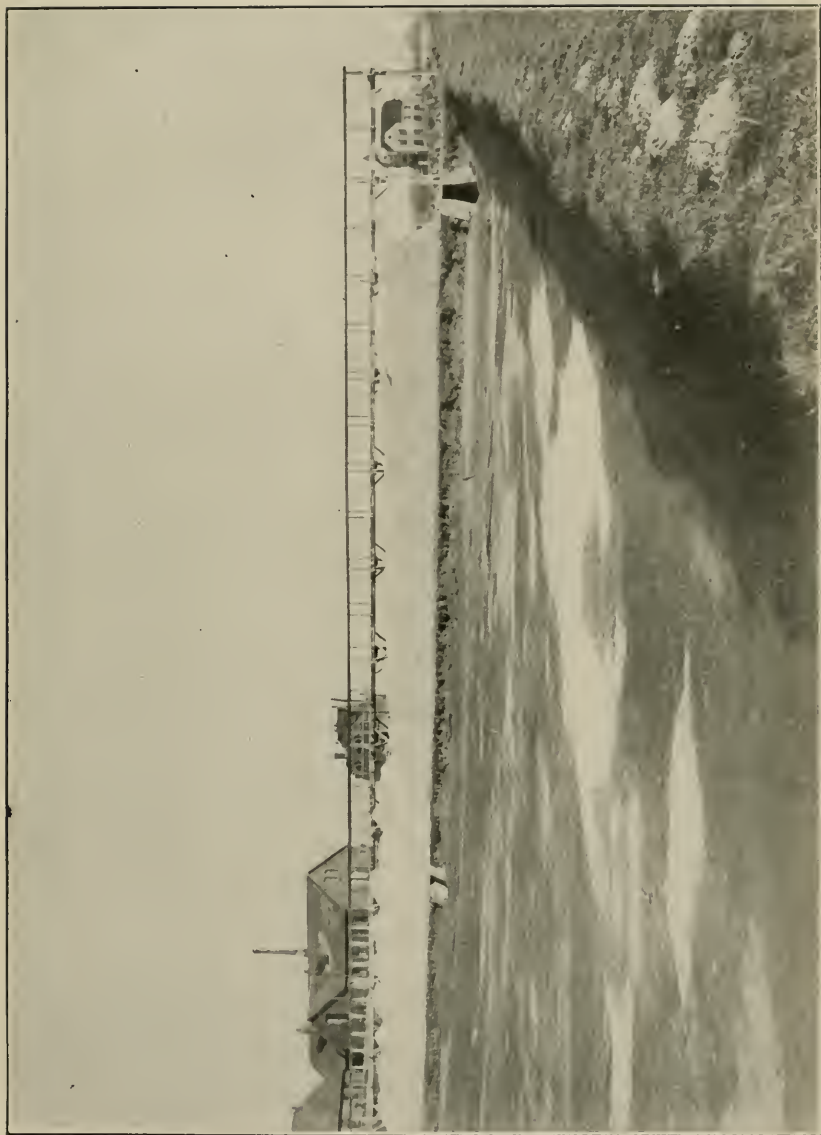


EXHIBIT B.

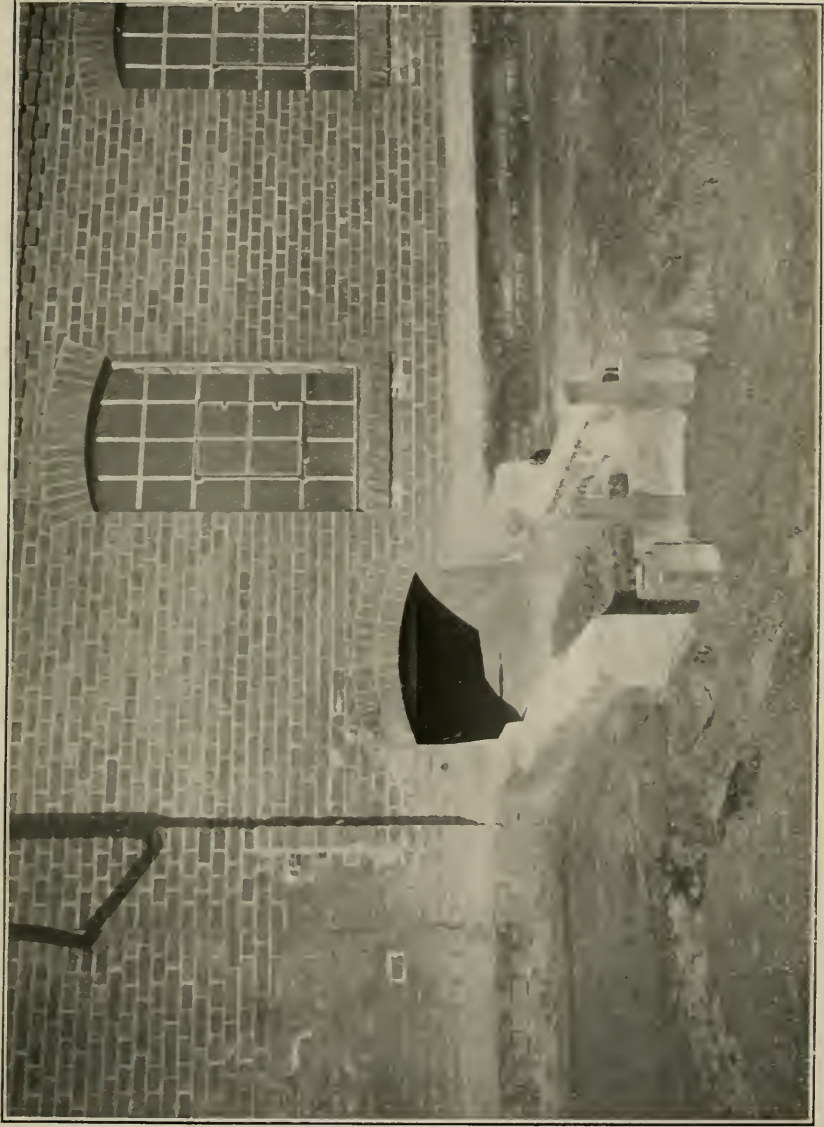


EXHIBIT C.

demand and a ready sale for the waste lime from the sugar factories in Germany, and as it would take much more waste lime to get the same percentage of alkalinity as can be obtained from quicklime, there is more money in selling the waste lime to farmers and using the quicklime for the settling basin. The screenings from the wash water are carried back into the factory and whatever sugar they contain extracted therefrom. In this connection it should be stated that in the interview which I had with Dr. Kerp, of Berlin, previously referred to, it was stated as the Doctor's opinion that if the plan of screening the wash and press waters, followed by sedimentation, as carried out in Germany, was adopted in connection with the sugar factories of Michigan, there would be little, if any, objection to the discharging of the waste water directly from the settling basins into any river. This statement seems to be borne out by the fact that while some pulp from the pressing operation is discharged into the settling basin shown in Exhibits A. and B., very little organic matter was discernable in the basin which contained the settlings, many feet in depth and mostly in the nature of ordinary soil, of the entire campaign of 1909. This settling basin is about two and one-half acres in extent and about eight feet deep. Owing to the lack of proper lighting and the extensive character of the devices for screening the waste water in the factories visited, I was not able to obtain satisfactory photographs of the same; but Mr. Thos. Jackson, of the firm of Jackson & Church, of Saginaw, who went to Germany for the purpose of studying this class of machinery, has furnished this Department with two drawings of the most approved devices of this character, together with the following description of same:

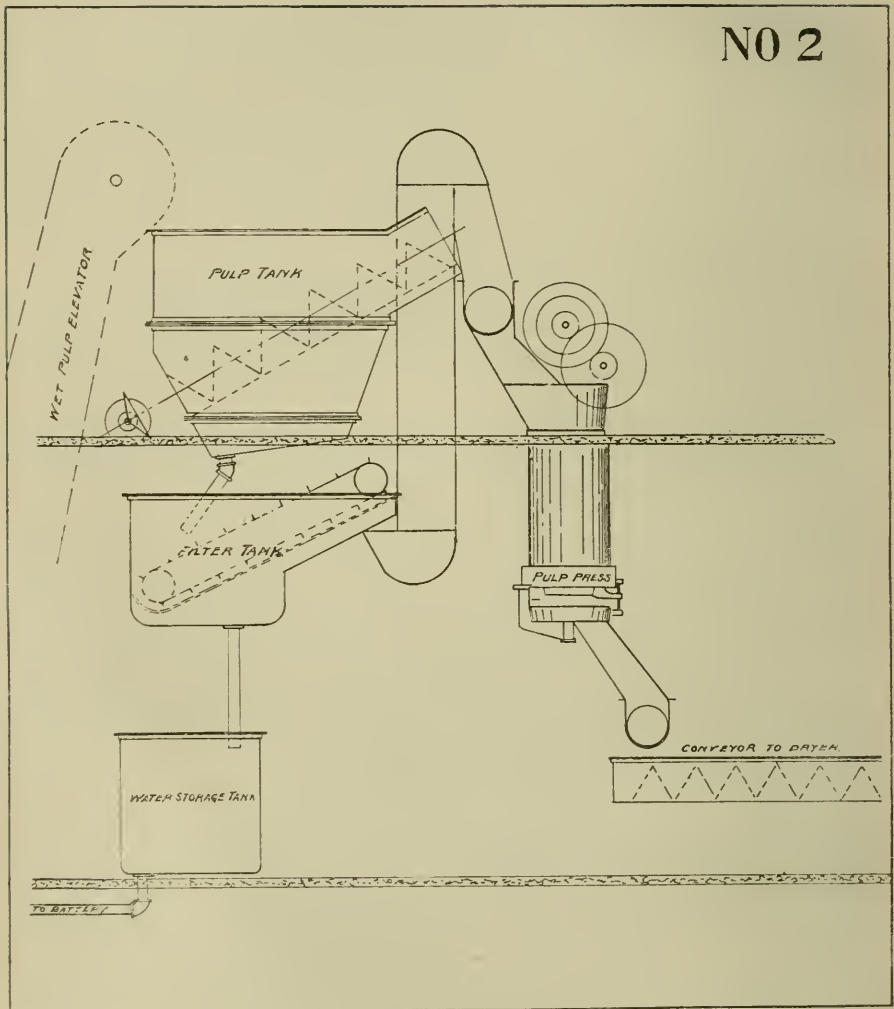
Drawing No. 2 shows the installation used for separating the solids from the pulp water. The apparatus consists of a filter tank, with a very fine slotted screen over which a drag operates. The pulp and water are elevated from the pit to the pulp tank and there separated, the pulp being fed, by a screw conveyor, to the presses, and the water running off to the filter tank where the finer particles of pulp are separated and elevated to the presses. From the filter tank the water is discharged into a storage tank which is used in connection with the washing out of the batteries.

Drawing No. 3 represents the beet tail catcher. The water from the beet washers flows over a screen, over which a drag operates, and the beet tailings are separated and fed through a small washer, which removes small stones, etc., and from thence pass on up, by means of an elevator, to a cutter where they are torn to pieces and then discharged into the drag conveyor which feeds the batteries.

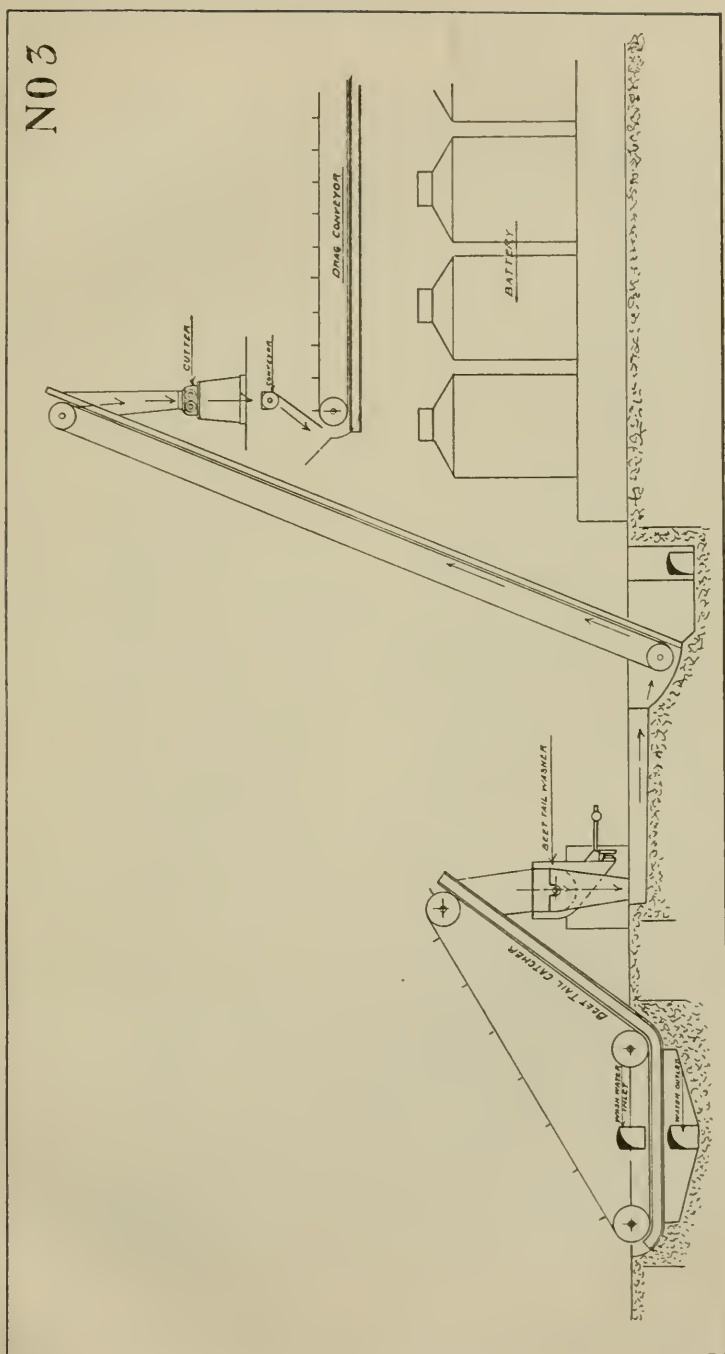
CLASS II. Where a factory is located near to a stream with a small average flow, insufficient to meet the daily needs of the factory, a sufficient amount of water for carrying the beets to the factory and for washing the beets is pumped into one or more settling basins at the beginning of the campaign and this water is used over and over during the entire campaign, screening being carried out each time the water is discharged back into the settling basin, or basins. At the end of the campaign, the water from the settling basin, or basins, is permitted to be discharged into the river or stream, usually in small quantities or at such times as the flow of water in the river or stream is greatest. This method is the nearest approach to a sanitary disposal of such waste water which was found in my travels. The settling basins of two representative plants of this kind are shown in Exhibits D. and E. The six small settling basins shown in Exhibit D are each about 15 ft.x25 ft. in area and 8 ft. deep, and are arranged so that they can be operated singly or in series. The larger basin, from which the water flows direct to the beet sheds for carrying purposes, is about 25 ft.x 30 ft. in area and 8 ft. deep. All are filled with water at the beginning of the campaign. Whenever a settling basin becomes filled with mud from the carrying and washing of the beets, the flow of water through that basin is cut out temporarily and the mud discharged, through a large valve in the bottom of the basin, into a large settling basin about 2½ acres in extent. Provision is made whereby the water in this settling basin may be discharged, at the end of the campaign or whenever desired, into another large settling basin and from this basin on to a field which is underdrained into a creek. An arrangement is made by which the clearest water in the first the two large settling basins may be pumped into the factory for the purpose of washing the beets after it has been neutralized by the addition of lime. The press water from this factory passes directly into the first of the two large settling basins.

The settling basin shown in Exhibit E is so constructed that it may be divided into two parts, the upper end being intended for the retention of solid matters and the lower end for the clearest water. Both halves are filled with water at the beginning of the campaign, and this is used over and over for carrying and washing the beets until the close of the campaign. At the time the photograph was made, the upper end of this basin contained the entire amount of solid matter deposited during the campaign of 1909.

NO 2



DRAWING NO. 2.



DRAWING NO. 3.

In two out of the entire number of sugar factories visited, the waste water is made to flow from the settling basins on to land which is underdrained before it enters the natural watercourse; but, in one instance, the land would cease to act as a filtering medium whenever the water in the river was high.

As a rule, in the factories visited, the waste water from the diffusion batteries is used over and over, and replenished from time to time, during the campaign.

In those factories where the supply of water is small, the water which is used for the purpose of condensation is used over and over, being cooled by a contrivance similar to that shown in Exhibit F, which consists of a number of layers of brush wood over and through which the water trickles to the reservoir below when it is again ready for use.

As before stated, an accumulation of beet pulp on the premises of the sugar companies in Germany is strictly prohibited; and what pulp is not dried for stock food, or used in the manufacture of alcohol, is hauled on to the farm lands and there placed in what are termed silos, corresponding in construction to the pits in which vegetables are often stored out of doors in Michigan. From these pits the pulp is cut and fed to the stock from time to time. No objectionable odors were discerned in the vicinity of any of the pits inspected.

As far as could be learned, the entire lime wastes from the beet sugar factories in Germany are used for fertilizing purposes. The method of depositing these wastes where they can be easily reached by the farmers and others who haul it away is shown in Exhibits B and D., and, in Exhibit D., farmers may be seen in the act of removing the lime.

A general comparison of the methods in use in Michigan and in Germany for disposing of the wastes from beet sugar factories shows:

1. That, in Michigan, so far as we have been able to learn, with but one exception and that only in the nature of an experiment, no attempt has been made to screen the wash and press waters from the factories before they are discharged into the natural water-courses or settling basins; while, in Germany, devices for this purpose are the rule.

2. That, in Michigan, many sugar factories discharge the waste water, often containing large quantities of putrescible and other objectionable material, directly into rivers without previous sedimentation; while, in Germany, sedimentation is practically universal.

3. That, in Michigan, much valuable material, in the shape of beet pulp, is wasted by being dumped on to land and allowed to rot, thus becoming a source of nuisance and a probable danger to the health of the people in the vicinity of the factories; while, in Germany, the entire pulp output of the factories is put to some useful purpose.

4. That, in Michigan, so far as is known, the lime wastes of the sugar factories are dumped where they can be the most economically or easily disposed of; while, in Germany, these wastes are all made use of for fertilizing purposes.

CONFERENCE, AT SAGINAW, RELATIVE TO THE DISPOSAL OF SEWAGE FROM THE PLANT OF THE MICHIGAN SUGAR COMPANY, AT CARO.

On May 13, 1910, in company with Attorney General John E. Bird, the Sanitary Engineer went to Saginaw to assist in a conference of persons interested in the suit instituted by the village authorities at Vassar against the Michigan Sugar Company for contamination of the Cass river.

In view of the representations made at this conference that the Michigan Sugar Company were then working on plans for taking care of the sewage from their plant at Caro, so that it would not be a further source of complaint on the part of the people at Vassar, it was agreed that the proceedings against the Sugar Company be put over until the next term of Court, and from that time until the following term of Court, if necessary, to try out any plans which the Sugar Company might adopt for the purification of the sewage.

CONFERENCE WITH OFFICIALS OF THE CONTINENTAL SUGAR COMPANY RELATIVE TO THE DISPOSAL OF SEWAGE FROM THE SUGAR FACTORY AT BLISSFIELD.

In accordance with the request of Attorney General John E. Bird, on June 6, 1910, the Sanitary Engineer went to Blissfield to confer with the local officials and the Attorney of the Continental Sugar Company relative to proposed plans for disposing of the sewage from the sugar factory at that place. The following is extracted from the report of the Sanitary Engineer upon the conference in question:

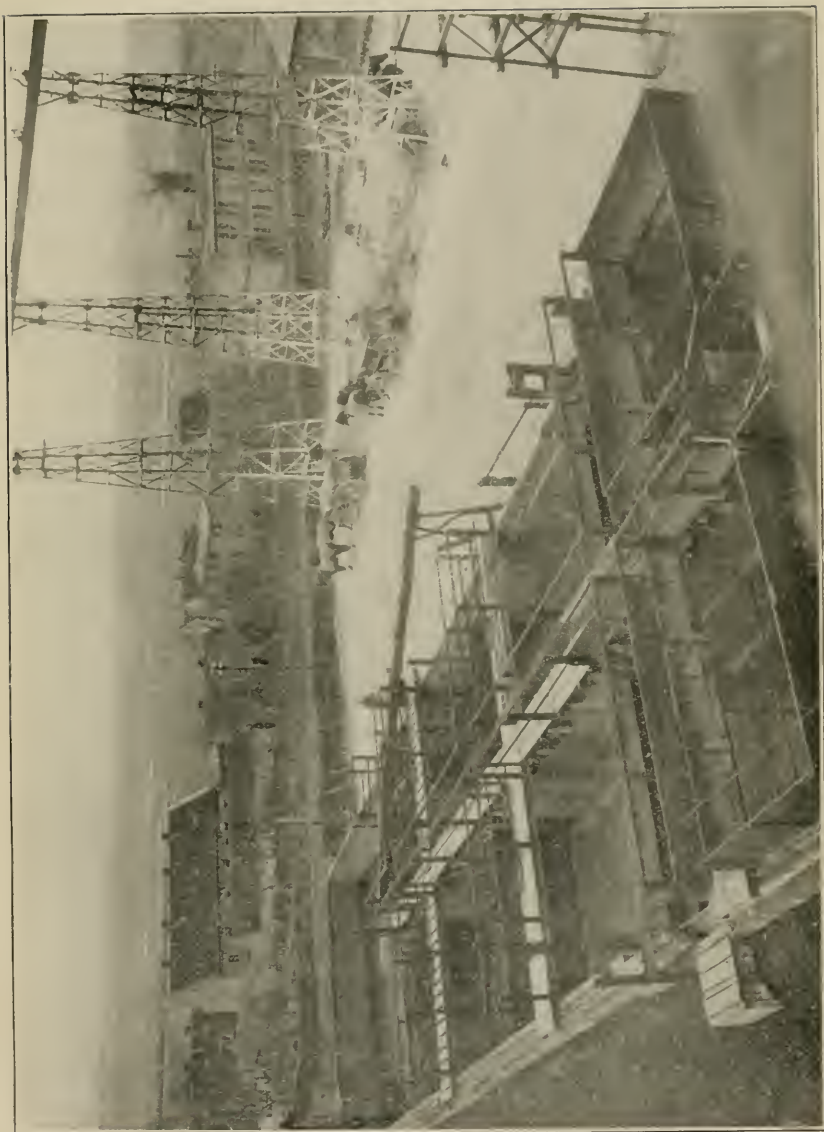


EXHIBIT D.

EXHIBIT E.

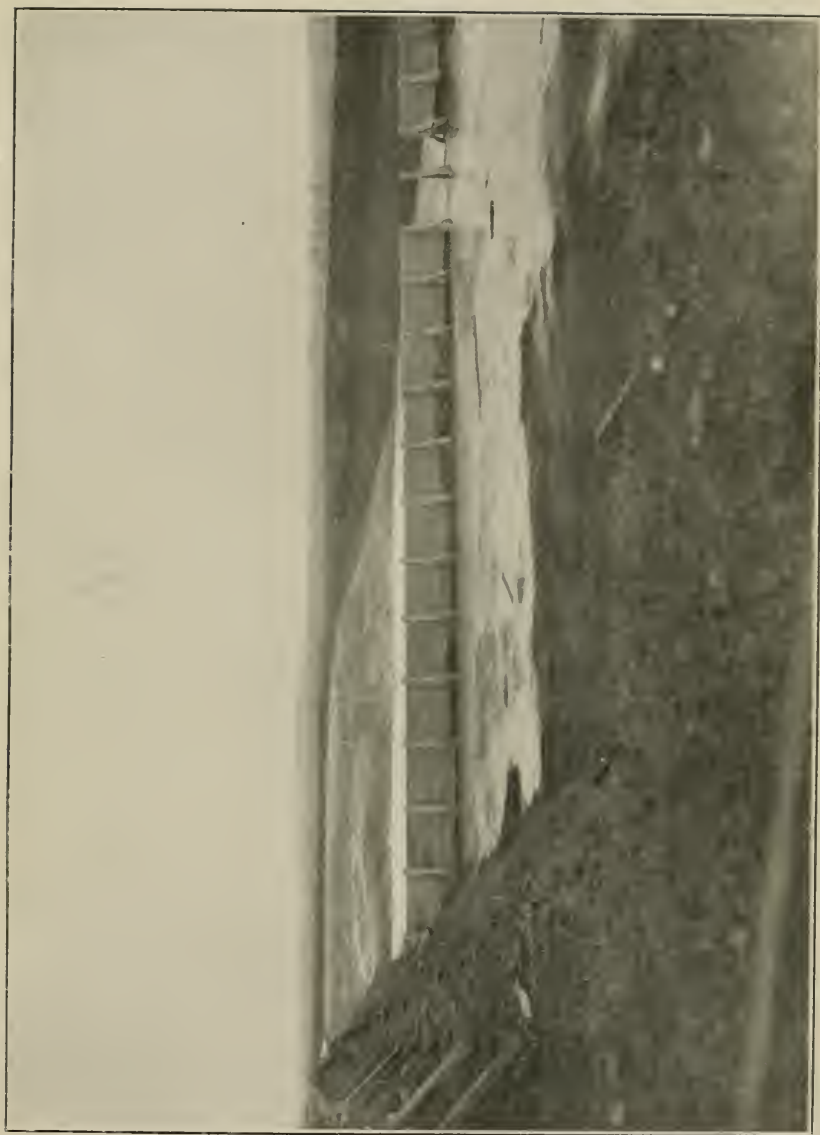




EXHIBIT F.

Plans have been made and the ground has been staked out for the installation of a drier for taking care of the output of pulp, and the silo which has, heretofore, been the receptacle for the pulp is being cleaned out and the old pulp spread on land and plowed in.

It is proposed to utilize a portion of the old silo, about forty feet in width and two hundred feet in length, as a filter for the press water; the filter to be composed of cinders, five or six feet in depth, laid over eight inch drain tile, and divided into three sections so that each section can be given a rest whenever necessary and for the purpose of cleansing or repairs. The effluent from the filter beds will pass into the river through the same drains which removed the liquid which drained out of the pulp when in the silo.

It is also proposed to properly screen the waste water from the beet carriers and washers by means of a much larger screen than was in use, as an experiment, for about one month prior to the close of the campaign last year, and to pass the screened water direct to the river.

It is the wish of the officials of the Sugar Company to try out the proposed methods of disposing of the sewage from this factory for one season, as any further purification of the carrier and wash waters than what could be secured by the proposed means would entail a very considerable outlay of money for the preparation and maintenance of filter beds and the pumping to these beds of about two million gallons of waste water every day during the campaign.

The discharge of the entire sewage of this factory, after screening, onto a piece of land, properly underdrained, would properly purify the sewage, but, owing to local conditions, this method is not practicable.

It is believed that the filtration of the press water and the screening of the carrier and wash waters, as proposed, will effect a very considerable purification of the waste water from the factory; but whether this will be sufficient to prevent the same from causing a nuisance, by the putrefaction of the organic matter remaining in suspension or solution, at some point in the river below the factory, cannot be determined in advance.

In view of the difficulties in the way of the adoption of the best known methods for the purification of the sewage from this factory, and the possibility that the proposed filtration of the press water and the screening of the carrier and wash waters may be sufficient to prevent a nuisance at any point in the river, I would suggest that the proposed plan be given a thorough test, under the supervision of this Department, during the next campaign, and that the parties who have been aggrieved in the past by the nuisance from the river below the factory be invited to cooperate with this Department and with the officials of the sugar factory in the matter.

CONFERENCE WITH OFFICIALS OF THE MICHIGAN SUGAR COMPANY RELATIVE TO THE DISPOSAL OF SEWAGE FROM THE SUGAR FACTORY AT CARO.

In accordance with the request of Mr. W. H. Wallace, General Manager of the Michigan Sugar Company, on June 17, 1910, the Sanitary Engineer went to Caro to confer with the officials of the Sugar Company relative to the disposal of sewage from the sugar factory at that place. The following is extracted from the report of the Sanitary Engineer upon this conference:

The Sugar Company contemplates the installation of a screening apparatus for the purpose of removing from the wash and carrier waters all roots and other solid matters which can be removed by this means, after which the waste water is to be conveyed, by an underground sewer for a certain distance and then by an open iron trough, across the river to a large area of land recently purchased for the purification of the sewage. Here the waste water will first pass through two large settling basins; and, from thence, over a series of steps, to secure aeration, onto about twenty acres of land which will be underdrained by four inch field tile. Each line of tile will have a separate outlet into the river; and, in the event of the tile becoming clogged or not being able to take care of the waste water at all times as fast as it may be discharged onto the filtration area, provision will be made at the west end of this area for the overflow of the surplus water onto a piece of swampy land which is overgrown with brush. The water from the presses will not be discharged continuously into the sewer, as heretofore, but will be filtered and returned to the diffusion batteries.

It is believed that the proposed plan will prevent any objectionable contamination of the river, but it has been suggested by the State Bacteriologist that much better results would be expected if the waste lime from the factory was mixed with the waste water before it enters the first settling basin.

For the information of this Department, and for the satisfaction of everyone concerned

in the past controversy relative to the disposal of sewage from this factory, it is recommended that, during the next campaign, samples of water be taken and analyzed by this Department, from such points as may be necessary to show what the purification plant is doing.

Respectfully submitted,
(Signed) THOS. S. AINGE,
Sanitary Engineer and Acting State Medical Inspector.

LABORATORY REPORT FOR THE FISCAL YEAR ENDING JUNE 30, 1910.

Dr. F. W. Shumway, Secretary State Board of Health:

Dear Doctor:—I beg herewith to submit the report of the work of the laboratory for the fiscal year ending June 30, 1910. It will be noted that the number of examinations has materially increased and our progress has been in a general way satisfactory. We have received during the year a large number of letters from physicians expressing appreciation of the aid the State Board of Health Laboratory has been to them in controlling, diagnosing and tracing the source of communicable diseases. Such letters together with the constantly increasing number of samples received each month indicate the value of this line of work to the State, and we believe that this laboratory is rapidly becoming the most valuable department of the State Board of Health. We are at the present time in need of a more liberal supply of mailing cases for transmitting infectious material through the mails and believe such cases should be more generally distributed in the various communities. Several special investigations have been undertaken during the year, some of which are included in the report of the Sanitary Engineer, others having been published in various scientific journals. Some of these investigations have been important and exhaustive, but the space allowed in this report is not sufficient to permit of any detailed consideration.

An extensive investigation of the various types of proprietary preparations of formaldehyde on the market as well as the permanganate-formalin and the formalin sheet spraying methods of room fumigation was undertaken during the months of August, September and October. The results of this investigation have been embodied in a separate report submitted in December, 1909. This report has been published in part in the *Journal of Infectious Diseases**, but will be briefly reviewed in another part of this report.

SUMMARY OF EXAMINATIONS, YEAR ENDING JUNE 30, 1910.

Total number of examinations.....	4,770
Chemical and Bacteriological examinations of water for potability..	296
Sputa and other discharges examined for tubercle bacilli.....	1,282
Throat Swabs examined for diphtheria bacilli.....	537
Blood Samples examined for Widal's reaction.....	181
Chemical and Microscopical examinations of urine.....	72
Chemical and Bacteriological examinations of milk.....	21
Pathological examinations of feces.....	12
Pathological examinations of tumors.....	12
Examinations of Disinfectants.....	2,144
Pathological examinations of stomach contents.....	3

*Vol. 7, No. 5, Oct., 1910, pp. 641-663.

Toxicological examinations.....	20
Miscellaneous blood examinations.....	22
Examinations for rabies.....	3
Examinations of temperance beer.....	5
Examinations of cider.....	3
Examinations of whiskey.....	1
Examinations of pop.....	1
Examinations of ice.....	9
Examinations for venereal disease.....	43
Other miscellaneous examinations.....	103

SUMMARY OF EXAMINATIONS ARRANGED BY MONTHS.

Month.	Waters.		Sputa Tuberculosis.		Throat Swabs. Diphtheria.		Blood Widal's Reaction.		Miscellaneous.	Total.
	Safe.	Unsafe.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.		
July, 1909.....	12	19	11	40	4	18	4	5	21	134
August, 1909.....	14	24	19	31	20	9	9	12	406	544
September, 1909.....	8	23	13	46	9	14	15	10	1,132	1,270
October, 1909.....	6	17	21	46	14	13	15	8	681	821
November, 1909.....	13	27	38	62	22	31	11	10	22	236
December, 1909.....	5	8	32	73	6	17	2	6	16	165
January, 1910.....	9	6	33	84	11	21	5	5	17	191
February, 1910.....	3	4	23	88	10	19	3	10	22	182
March, 1910.....	11	11	47	117	12	26	1	9	30	264
April, 1910.....	3	10	42	109	16	36	3	10	35	264
May, 1910.....	16	9	51	121	47	103	2	12	45	406
June, 1910.....	28	10	29	106	9	50	4	10	47	293
Total.....	128	168	359	923	180	357	74	107	2,474	4,770

POTABLE WATER.

During the year the laboratory has examined 296 samples of water for potability. These samples came from 88 different localities.

When one observes that nearly 60% of these water samples have been unsafe for drinking purposes, he cannot but be impressed that there is a general need for a systematic investigation of the water supplies in the state.

There is at the present time but very few inland lakes and rivers that furnish a water supply safe for drinking purposes and the contamination is increasing from year to year. The amount of sewage entering the "Great Lakes" system is increasing and cities located upon their shores and using their water must either from time to time extend their intakes further out or construct purification plants.

Many of the inland cities and towns depend upon wells for their water supply and such wells are often badly constructed and improperly protected.

Some individuals evidently regard a well as a hole in the ground with a curbing to serve no other purpose than to prevent collapse. Wells curbed with brick, boards or stone are seldom safe if there be any source of contamination in their vicinity. We believe the Department should issue circulars of instructions to the people in the State, calling attention to the danger from contaminated wells and giving detailed information concerning their proper construction.

The general notion that spring water is always pure should also be dispelled. Some of the popular spring waters in the state have been found to be badly contaminated, and on a few occasions spring waters said to possess medicinal qualities have been found to contain enormous quantities of bacterial contamination and apparently in some instances such contamination has been the source from which alleged medicinal properties were derived.

The typhoid mortality in this State is certainly too high and inasmuch as contaminated water is known to be one of the chief carriers of typhoid infection we believe this subject should receive early and careful attention. While we hesitate in consideration of this enormous problem let us not forget the now famous Mills-Reineke phenomenon and Hazen's Theorem,—“Where one death from typhoid fever has been avoided by the use of better water, a certain number of deaths, probably two or three, from other causes have been avoided.”

SUMMARY OF WATER EXAMINATIONS FOR THE YEAR ENDING JUNE 30, 1910.

Location.	Total examined.	Safe.	Unsafe.
Alamo.....	1	1	0
Armada.....	1	0	1
Bay City.....	10	2	8
Bay Port.....	1	1	0
Belding.....	2	0	2
Benton Harbor.....	16	8	8
Blissfield.....	1	1	0
Boyne Falls.....	3	2	1
Buckley.....	3	0	3
Cassopolis.....	6	4	2
Champion.....	1	0	1
Charlevoix.....	1	1	0
Clare.....	1	1	0
Clayton.....	1	0	1
Clifford.....	4	0	4
Clinton.....	1	1	0
Coldwater.....	1	1	0
Concord.....	1	0	1
Davis.....	1	0	1
Dowagiac.....	1	1	0
Dowling.....	1	1	0
East Tawas.....	2	0	2
Elkton.....	3	0	3
Escanaba.....	1	0	1
Fenton.....	1	0	1
Flint.....	11	1	10
Fountain.....	1	0	1
Fowlerville.....	1	1	0
Freeland.....	4	0	4
Fremont.....	2	0	2
Galien.....	2	1	1
Hartford.....	5	3	2
Harvard.....	1	0	1
Hillsdale.....	1	0	1
Holland.....	6	5	1
Houghton.....	2	2	0

Location.	Total examined.	Safe.	Unsafe.
Howell.....	4	3	1
Hudson.....	1	0	1
Ionia.....	1	1	0
Kalkaska.....	2	0	2
Lambertville.....	1	0	1
Lansing.....	10	6	4
Lapeer.....	1	1	0
Ludington.....	3	1	2
Lyons.....	2	1	1
Mackinaw City.....	2	0	2
Mancelona.....	10	1	9
Manchester.....	1	0	1
Manistique.....	2	0	2
Marquette.....	49	32	17
Melvin.....	1	0	1
Menominee.....	1	1	0
Midland.....	3	0	3
Millburg.....	1	0	1
Monroe.....	1	0	1
Mt. Clemens.....	2	1	1
Munising.....	3	0	3
Newberry.....	3	3	0
Norwood.....	1	1	0
Okemos.....	2	2	0
Olivet.....	1	1	0
Onaway.....	3	0	3
Ontonagon.....	2	0	2
Ortonville.....	1	0	1
Oshtemo.....	1	0	1
Owosso.....	1	0	1
Parma.....	1	1	0
Paw Paw.....	2	1	1
Petoskey.....	2	2	0
Pinckney.....	1	0	1
Pinnebog.....	1	1	0
Pontiac.....	6	1	5
Port Huron.....	1	0	1
Portland.....	1	0	1
Powers.....	2	0	2
St. Clair.....	7	3	4
St. Johns.....	2	2	0
St. Louis.....	8	4	4
Saranac.....	3	1	2
Shelby.....	1	1	0
Stambaugh.....	1	1	0
Sutton's Bay.....	1	0	1
Tekonsha.....	1	1	0
Vandalia.....	1	1	0
Walled Lake.....	1	1	0
White Pigeon.....	1	1	0
Wyandotte.....	12	1	11
Zeeland.....	3	0	3

TUBERCULOSIS.

During the year, 1,282 sputa were examined as against 442 examined during the previous year. This is a very substantial increase and indicates that a large number of physicians appreciate the opportunity of being thus able to obtain free examinations in this class of cases.

In addition to above we have also made examinations of a considerable number of specimens of such material as spinal fluid, tissues, urine, feces and other discharges for tuberculosis, such examinations being included among miscellaneous examinations.

In the examination of suspected tubercular material we have given considerable attention to the use of a preparation known as "Antiformin" which consists of equal parts of liquor sodae chlorinatae (B. P.) and fifteen per cent solution of caustic soda. This preparation destroys ordinary bacteria very quickly but acts slowly upon bacteria of the acid-fast group. It is a powerful oxidizing agent and eliminates the organic matter by solution, after which the tubercle bacilli may be centrifuged out, washed and stained in the usual way. By the use of "Antiformin" in quantities of from 10% to 50% some workers have reported that over 20% of the discharges that were negative on direct smears proved positive after treatment with antiformin. Our results have been somewhat less favorable. In the examination of about 200 sputa found negative on direct smears, three were positive after treatment with antiformin. All cases however that were positive on direct smears have invariably shown a greatly increased number of tubercle bacilli to the field after treatment with antiformin, and the staining properties of the bacilli seem to be very much improved. We regard the use of antiformin as a material improvement over any other method introduced for eliminating organic matter and concentrating tubercle bacilli in the various discharges and find it of special value in the examination of urinary sediments, feces and bloody sputa.

SUMMARY OF SPUTA EXAMINATIONS.

Total number of sputa examined for tubercle bacilli.....	1,282
Total number positive.....	359
Total number negative.....	923

Other organisms associated with tubercle bacilli in sputa:

Streptococci, 23.
 Staphylococci, 3.
 Pneumococci, 38.
 B. Influenza, 1.
 Micrococcus Catarrhalis, 1.
 Leptothrix, 1.
 Other organisms absent or not identified, 289.

Other organisms predominating where tubercle bacilli were absent:

Streptococci, 69.
 Staphylococci, 22.
 Pneumococci, 210.
 Bacillus Influenza, 59.
 Micrococcus Catarrhalis, 29.
 Bacillus Diphtheria, 7.
 Leptothrix, 1.
 Micrococcus Tetrageous, 1.
 Proteus Vulgaris, 1.
 Bacillus Mucosus Capsulatus, 1.
 Saccharomyces, 4.
 Bacillus Fusiformis, 1.
 Other organisms absent or not identified, 513.

DIPHThERIA.

During the year, 537 throat swabs were submitted as against 298 during the previous year. Of these, 422 were for diagnosis and 115 for release from quarantine. The importance of these examinations cannot be too strongly impressed upon the profession. The presence or absence of Klebs-Loeffler bacilli in a patient's throat should be determined in every suspicious affection and always before a patient is released from quarantine.

A glance at the "Summary of Throat Swabs Examined" given below cannot but convince an average individual that the diagnosis of a membranous throat affection without a bacteriological examination is not only unreliable but unscientific.

Membranous affections of the throat are usually the result of mixed infections and there is probably a dozen different species of bacteria that may enter into the formation of the membrane. Quite generally at least two or more different species enter into the formation of the same membrane and these associated organisms may materially modify the character of the membrane and the general appearance of the case.

SUMMARY OF THROAT SWABS EXAMINED, YEAR ENDING JUNE 30, 1910.

Total number of throat swabs examined.....	537
Total number of throat swabs showing B. Diphtheria....	180
Total number of throat swabs showing absence of B. Diphtheria.....	357
Total number of throat swabs examined for release from quarantine.....	115
Total showing B. Diphtheria present.....	56
Total showing B. Diphtheria absent.....	59
Total number of throat swabs examined for diagnosis.....	422
Total showing B. Diphtheria present.....	124
Total showing B. Diphtheria absent.....	298
Total number of swabs examined from cases where previous diagnosis of diphtheria had been made from clinical findings.....	125
Total showing B. Diphtheria present.....	56
Total showing B. Diphtheria absent.....	69
Per cent of cases of clinical diphtheria not caused by B. Diphtheria..	55
Total number of swabs examined where clinical diagnosis was regarded as questionable.....	179
Total showing B. Diphtheria present.....	46
Total showing B. Diphtheria absent.....	133
Per cent of questionable cases found to be diphtheria.....	26
Total number of swabs examined from cases where previous diagnosis other than diphtheria had been made.....	116
Total showing B. Diphtheria present.....	20
Total showing B. Diphtheria absent.....	96
Per cent found to be diphtheria.....	17

Other organisms identified when associated with B. Diphtheria in swabs examined for diagnosis:

Staphylococci, 3.
 Streptococci, 5.
 Micrococcus Catarrhalis, 3.
 Bacillus Fusi ormis, 23.
 Pneumococci, 7.
 Bacillus Influenza, 1.
 Leptothrix Buccalis, 2.
 Other organisms absent or not identified, 80.

Other organisms found to predominate in cases that were considered diphtheria clinically but were not diphtheria bacteriologically:

	Swab.	Culture.
Streptococci.....	3	15
Staphylococci.....	8	35
Pneumococci.....	13	4
Micrococcus Catarrhalis.....	2	5
Bacillus Fusiformis.....	19	0
Bacillus Coli.....	1	0
No organisms present or not identified.....	23	10

Bacillus Fusiformis was found to predominate in direct smear from the swabs 101 times. The cultures from these smears showed the following:

Streptococci, 27.
 Staphylococci, 42.
 Bacillus Diphtheria, 23.
 Micrococcus Catarrhalis, 5.
 Pneumococci, 3.
 B. Coli, 1.

Organisms found to predominate in negative cases of suspected diphtheria:

	Swab.	Culture.
Streptococci.....	12	76
Staphylococci.....	41	136
Pneumococci.....	63	27
Micrococcus Catarrhalis.....	14	27
Bacillus Influenza.....	3	0
Bacillus Fusiformis.....	78	0
Bacillus Coli.....	0	3
Leptothrix Buccalis.....	2	0
Saccharomyces Albicans.....	0	2
Hofmann's Bacilli.....	0	2
No organisms present or not identified.....	88	28

FORMALDEHYDE DISINFECTION.

Formaldehyde has been in use for surface and space disinfection over twenty years and is recognized as one of the most efficient agents available at the present time. The preparation generally used up till a few years ago was the so-called "Formalin," which is a watery solution of the gas, containing about

37% to 40% of formaldehyde. Various methods of charging the rooms with formalin have been proposed, the most important being as follows:

1. The retort method.
2. The autoclave method.
3. The permanganate-formalin method.
4. The sheet spraying method.
5. Formalin-aluminum-sulphate-lime.

The publication of Bulletin No. 27, U. S. Hygienic Laboratory, 1906, placed the above methods of disinfection and their comparative efficiency upon a thoroughly scientific basis, and since that time the permanganate-formalin method has been a general favorite on account of its efficiency as well as simplicity. The only apparatus required is any capacious metal vessel, such as a pail, dishpan or tub, and these may generally be found in the average dwelling house. The most important formulae in use for disinfection with permanganate-formalin are the following:

Evans' Formula.

Potassium Permanganate.....	4.75 oz. by weight
Liquor Formaldehyde.....	10.00 oz. by volume

Approximate amount of absolute formaldehyde available for disinfection, 2.2 oz.

McClintic's Formula.

Potassium Permanganate.....	5.00 oz. by weight.
Liquor Formaldehyde.....	10.00 oz. by volume

Approximate amount of absolute formaldehyde available for disinfection, 2.40 oz.

Hill's Formula.

Potassium Permanganate.....	7.00 oz. by weight
Liquor Formaldehyde.....	10.00 oz. by volume

Approximate amount of absolute formaldehyde available for disinfection, 2.60.

Hill's Formula—Diluted.

Potassium Permanganate.....	11.00 oz. by weight
Liquor Formaldehyde.....	11.00 oz. by volume
Water.....	9.00 oz. by volume

Approximate amount of absolute formaldehyde available for disinfection, 2.20.

The amount of formaldehyde destroyed during the reaction is practically proportionate to the amount of permanganate used, up to certain limits. When the permanganate is increased above the proportion of 7 to 10, the amount of destruction is no longer proportionate because the heat of the reaction will drive off the formalin before all of the permanganate is reduced. The amount of formalin remaining in the residue increases very rapidly as the permanganate is decreased and this increase is far from being compensated by the lessened destruction. It will be observed that in "Hill's Formula—Diluted" the proportion of available formaldehyde is proportionately decreased, but nevertheless this formula is especially efficient on account of

the increased amount of moisture liberated, which is very essential to successful disinfection with formaldehyde.

During the last few years a number of preparations of solidified formaldehyde have been placed upon the market. Such preparations are commendable only for convenience and simplicity. They are usually sold as proprietary products put up by various manufacturers in the form of special apparatus. The formaldehyde used is either in the form of dry powder containing from 90% to 98% of formaldehyde or pastes containing varying proportions of water and from 50% to 80% of formaldehyde. The methods of liberating the gas varies. In some instances potassium permanganate is used. When this method is used the principle is the same as the permanganate-formalin method. The proportions of water, permanganate and absolute formaldehyde used should be about the same as in the permanganate-formalin method, otherwise the results are not to be relied upon. In some instances the dry formaldehyde itself is ignited and the heat thus generated liberates a portion of the product in gaseous form. By this method the destruction of formaldehyde is enormous and variable and we regard the disinfection thus carried out as unreliable and practically worthless.

The favorite apparatus marketed by proprietary dealers consists of a metal box containing formaldehyde either in the form of powder or paste, this being placed over a base containing paraffin or similar substance having a wick in the center which is ignited to evaporate the product. There are many forms of this apparatus upon the market, modified either to prevent ignition or to evaporate small quantities of moisture.

In considering the use of proprietary forms of formaldehyde it should be remembered that they are made to sell. Each dealer or agent has his particular argument. Some will claim special efficiency because their product melts; others will claim that with their special apparatus the product cannot ignite; others will claim special efficiency because of small amounts of added water, and still others will claim that their product does not polymerize.

If sufficient water be evaporated to materially increase the humidity of the room this factor is unquestionably of value, but such quantities as $\frac{1}{2}$ or 1 oz. cannot have any material influence. All other arguments should be accepted with reluctance. It has been well shown that formaldehyde gas is the same whether generated from solidified formaldehyde or the liquid product, and the amount of absolute formaldehyde required for the disinfection of a given surface or space varies only with humidity and temperature and has practically no relation to the product from which the gas is evaporated.

The proprietary agents may present many arguments and testimonials. They argue for a living and testimonials are in many instances open to suspicion. It is possible to kill experimental cultures of various bacteria under favorable conditions with extremely small quantities of formaldehyde. This however is not only possible with proprietary products but with standard methods of formalin disinfection as well. From our extensive experiments and general experience we do not believe that the Board is justified in approving any apparatus for room disinfection which does not liberate at least two ounces of absolute formaldehyde for every 1,000 cu. ft. of space, and in addition to this we believe the efficiency of the gas for the average room varies with the rapidity with which it is liberated.

Respectfully submitted,
(Signed) M. L. HOLM, Ph. C., M. D.,
Bacteriologist.

FINANCIAL STATEMENTS.

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE
BOARD OF HEALTH (UNDER PUBLIC ACT NO. 18 OF 1905), DURING
THE FISCAL YEAR ENDING JUNE 30, 1910.

Expenses of members:	
Attending regular meetings.....	\$135 88
Other expenses.....	223 26
Engraving, drawing, etc.....	49 72
Instruments and books.....	53 50
Paper, stationery, etc.....	1,990 11
Postage.....	1,550 00
Printing and binding.....	2,212 63
Secretary.....	2,500 00
Special Investigation.....	6 11
Miscellaneous.....	278 70
Total.....	\$8,999 91

NOTE.—The appropriation (\$9,000.00) at the disposal of the State Board of Health for certain specified purposes, does not include clerk hire. The account of the appropriation (\$10,000.00) for clerk hire is kept in the Auditor General's department, and is published in his annual report.

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE
BOARD OF HEALTH (UNDER SECTION 7 OF ACT 132, LAWS OF 1903, AS
AMENDED BY ACT 151, LAWS OF 1907), EMBALMERS' FUND, AS
ALLOWED DURING THE FISCAL YEAR, 1910.

RECEIPTS.	DISBURSEMENTS.
Fees from applicants for li- censes and for renewals of licenses..... \$1,006 00	Expenses of members: Attending meetings..... \$344 49 Other official services..... 80 00 Paper, stationery, etc..... 119 31 Postage..... 150 00 Printing and binding..... 214 79 Drawing, engraving, etc..... 13 75 Compensation of extra clerks... 18 40 Miscellaneous..... 64 85 Unexpended balance, turned over to the State Treasurer... 41
Total receipts..... \$1,006 00	Total disbursements..... \$1,006 00

TOTAL AMOUNT AND CLASSIFICATION OF EXPENDITURES BY THE STATE
BOARD OF HEALTH. LABORATORY DEPARTMENT, (UNDER
SECTION 5 OF ACT 122, LAWS OF 1909) AS ALLOWED
DURING THE FISCAL YEAR 1909.

RECEIPTS.	DISBURSEMENTS.
State Treasurer, by appropriation..... \$5,000 00 Fees for chemical, bacteriological and toxicological examinations 336 50	Salaries of bacteriologist and clerks..... \$4,386 06 Compensation of extra clerk.... 165 80 Postage..... 89 00 Freight and Express..... 9 79 Printing..... 33 50 Mailing Cases..... 118 27 Books..... 42 70 Laboratory Supplies..... 491 24 Unexpended balance, turned over to State Treasurer..... 14
Total receipts..... \$5,336 50	Total disbursements..... \$5,336 50

PART II.

COMMUNICABLE DISEASES IN MICHIGAN DURING
THE YEAR ENDING DECEMBER 31, 1909,
AND PRECEDING YEARS.

INTRODUCTION.

This article is the twenty-ninth in a series upon the same general subject, begun in 1882. It presents a summary of the compilations of the reports received from health officers relative to certain communicable diseases in Michigan during the year 1909, together with a review of some of the information obtained from similar compilations in preceding years. The most dangerous diseases are treated in detail in the order of their importance as causes of deaths, as shown by the diagram below, (compiled from the Monthly Bulletin of Vital Statistics):

DEATHS IN MICHIGAN, 12 YEARS, 1898-1909.

PNEUMONIA

TUBERCULOSIS

TYPHOID FEVER

MENINGITIS

DIPHTHERIA

WHOOPING-COUGH

SCARLET FEVER

MEASLES

SMALLPOX

SOME OF THE PURPOSES OF THIS COMPILATION.

In the law establishing the State Board of Health, the Secretary of the Board is required to collect information concerning vital statistics and knowledge respecting diseases, and to disseminate such information among the people. In compliance with this requirement, it is the custom to collect, compile, tabulate and publish information relative to the causes, and methods of prevention and restriction, of the dangerous communicable diseases, under the following general heads: The General Prevalence of each disease; The Geographical Distribution of each disease; The Comparative Prevalence of each disease in Urban and Rural localities; The Reported Sources of Contagium of each disease; and The Restrictive and Preventive Measures in each disease. In the case of pneumonia, an effort is being made to learn the Period of Incubation of the disease. In the case of pneumonia, tuberculosis and meningitis, an effort is being made to show the Influence of Age and Sex, the Duration of Sickness, and the Seasonal Prevalence of each disease.

METHODS OF COMPILATION.

With the exception of pneumonia, tuberculosis, meningitis and typhoid fever, which have been studied by individual cases, the diseases have been compiled by *households*, instead of by *outbreaks* as in the past.

A *household* report is intended to include all the cases which occur in a house, or other place of abode, at or about the same time. When a period of over sixty days has elapsed since the last death or recovery in a household, should the disease reappear in the household and the source of contagium cannot be traced to the previous cases, a separate compilation is made of the subsequent cases. It will be seen, therefore, that it is quite possible for a particular disease to appear in the same household several times during any year and to be counted as one or as several households in the compilation, according to the circumstances attending the outbreaks.

GENERAL PLAN OF THE REPORTS.

Upon the receipt of information at this office that tuberculosis, diphtheria, typhoid fever, scarlet fever, measles, whooping-cough, meningitis, smallpox, German measles (rötheln), rabies or glanders, was present, or had recently been present, in any locality in the State, a letter was sent to the health officer, or, in his absence to the president of the board of health, mentioning the reported existence of the disease within his jurisdiction, indicating his duties and powers, and the proper measures to be taken in restricting the disease, transmitting documents of instruction relative to the prevention and restriction of the disease for distribution among the neighbors of families in which the disease is present, and asking for reports relative to the methods employed for the restriction of the disease, the results of efforts for suppressing it, and the number of cases and deaths in each outbreak. With this letter, in each instance, except in the case of rabies and glanders, there was sent a sufficient number of blanks for the preliminary and final reports.

The information contained in the several reports, together with other correspondence relative to outbreaks of such diseases, are the basis on which the statements made in this article are founded.

PNEUMONIA IN MICHIGAN IN 1909 AND PRECEDING YEARS.

GENERAL PREVALENCE.

As may be seen by reference to Table 1, the deaths from pneumonia in 1909, as compared with those of 1908, were slightly greater, while the reported cases were correspondingly less. The prevalence of this disease in 1909, as compared with the years previous, is noticeably less. While the prevalence of pneumonia seems to be less in 1908 and 1909 than in the preceding years, still we believe, and with good reason, that a large number of non-fatal cases are not reported to the local health officials and by them to this Department. The reason for this condition is probably due to the fact that pneumonia is not generally recognized as a communicable disease, but when it does become recognized as being communicable, then the reports of non-fatal cases will undoubtedly be much greater than at present.

At the present time this Department usually gets its first information of cases of pneumonia from the death certificates returned to the Secretary of State's Department.

TABLE 1.—*The prevalence of pneumonia in Michigan, in each of the six years, 1904-1909.*

Years.	Population *	Number of cases. †	Number of deaths.	Deaths per 100,000 of the population
1904.	2,530,016	3,790	2,913	114.7
1905.	2,557,275	3,227	2,636	103.1
1906.	2,584,533	3,387	2,839	109.8
1907.	2,611,792	3,976	3,159	121.0
1908.	2,639,050	3,177	2,502	94.8
1909.	2,666,309	3,142	2,563	96.1
Annual averages.	2,598,163	3,450	2,767	106.5

*Estimated for intercensal years.

†From a large number of localities only the fatal cases were reported, so that the figures in this column do not represent the number of cases that actually occurred.

GEOGRAPHICAL DISTRIBUTION OF PNEUMONIA.

In the consideration of this phase of the study of pneumonia, the State is divided into eleven geographical divisions,* the counties in each of which would be likely to have somewhat similar climatic conditions. Judging from the death rates of the several divisions shown in Table 2, pneumonia was most prevalent in the Southeastern Division and least prevalent in the Southwestern Division. Arranging the Divisions in the order of greatest death rates per 100,000 inhabitants, we have the Southeastern (155.5), Upper Peninsular (104.4), Western (101.8), Bay and Eastern (96.7), Central (95.2), Northern Central (93.8), Southern Central (93.1), Northwestern (90.7), Northern (85.1), Northeastern (83.9), and Southwestern (78.4). Compared with the average death rate for the State as a whole (106.5), the counties in which the disease was unusually prevalent during the six years, 1904-1909, are—Roscommon (176.9), Wayne (169.0), Tuscola (136.1) and Luce (135.0).

*The boundaries of the several divisions may be seen by reference to the annual report of this Board for 1886, pages 201 and 217.

TABLE 2.—*The geographical distribution of pneumonia, in Michigan, in the six years, 1904-1909, as indicated by the average number of cases and deaths, and the average deaths per 100,000 persons living, in each geographical division shown in the table.*

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
UPPER PENINSULAR DIVISION.....	284,380	391	297	104.4
Alger county.....	6,952	9	9	129.5
Baraga county.....	5,594	5	5	89.4
Chippewa county.....	22,617	29	23	101.7
Delta county.....	29,005	36	35	120.7
Dickinson county.....	19,590	17	16	81.7
Gogebic county.....	17,647	17	17	96.3
Houghton county.....	73,477	122	88	119.8
Iron county.....	8,884	12	10	112.6
Keweenaw county.....	5,377	13	5	93.0
Luce county.....	4,444	6	6	135.0
Mackinac county.....	8,587	7	6	69.9
Marquette county.....	39,242	66	39	99.4
Menominee county.....	26,102	28	26	99.6
Ontonagon county.....	7,772	11	5	64.3
Schoolcraft county.....	9,090	13	7	77.0
NORTHWESTERN DIVISION.....	94,826	136	86	90.7
Benzie county.....	11,481	13	11	95.8
Grand Traverse county.....	24,904	30	21	84.3
Leelanau county.....	10,995	13	10	91.0
Manistee county.....	26,746	54	27	100.9
Wexford county.....	20,700	26	17	82.1
NORTHERN DIVISION.....	90,509	106	77	85.1
Antrim county.....	15,084	18	16	106.1
Charlevoix county.....	17,730	23	13	73.3
Cheboygan county.....	18,344	20	16	87.2
Crawford county.....	4,424	6	3	67.8
Emmet county.....	19,118	23	16	83.7
Kalkaska county.....	7,905	7	6	75.9
Otsego county.....	7,904	9	7	88.6
NORTHEASTERN DIVISION.....	66,717	69	56	83.9
Alcona county.....	7,346	6	4	54.5
Alpena county.....	20,682	19	18	87.1
Iosco county.....	10,724	9	9	83.9
Montmorency county.....	3,691	6	4	108.4
Ogemaw county.....	9,969	14	11	110.3
Oscoda county.....	2,151	5	2	93.0
Presque Isle county.....	12,154	10	8	65.8
WESTERN DIVISION.....	287,701	354	293	101.8
Kent county.....	143,972	173	154	107.0
Lake county.....	5,026	4	3	59.7
Mason county.....	20,060	28	23	114.7
Muskegon county.....	37,584	49	44	117.1
Newaygo county.....	18,889	19	13	68.8
Oceana county.....	18,388	22	20	108.8
Ottawa county.....	43,782	59	36	82.2
NORTHERN CENTRAL DIVISION.....	110,874	153	104	93.8
Clare county.....	9,707	14	7	72.1
Gladwin county.....	9,874	8	7	70.9
Isabella county.....	24,933	47	24	96.3
Mecosta county.....	19,918	27	21	105.4
Midland county.....	14,759	15	13	88.1
Missaukee county.....	10,865	14	13	119.7
Osceola county.....	19,122	23	16	83.7
Rosconmmon county.....	1,696	5	3	176.9

*†These footnotes are below Table 1, on a preceding page.

TABLE 2.—CONCLUDED.

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
BAY AND EASTERN DIVISION.....	351,742	386	340	96.7
Arenac county.....	10,411	9	9	86.4
Bay county.....	64,117	74	67	104.5
Huron county.....	35,434	33	28	79.0
Lapeer county.....	26,681	44	30	112.4
Saginaw county.....	88,452	86	78	88.2
Sanilac county.....	34,750	32	26	74.8
St. Clair county.....	55,891	66	53	94.8
Tuscola county.....	36,006	42	49	136.1
CENTRAL DIVISION.....	317,359	399	302	95.2
Barry county.....	21,719	26	20	92.1
Clinton county.....	25,253	30	20	79.2
Eaton county.....	30,105	44	33	109.6
Genesee county.....	43,346	65	54	124.6
Gratiot county.....	30,941	40	30	97.0
Ingham county.....	45,975	52	36	78.3
Ionia county.....	34,814	43	35	100.5
Livingston county.....	18,015	23	17	94.4
Montcalm county.....	33,577	36	32	95.3
Shiawassee county.....	33,614	40	25	74.4
SOUTHWESTERN DIVISION.....	144,088	149	113	78.4
Allegan county.....	39,033	40	31	79.4
Berrien county.....	49,531	46	34	68.6
Cass county.....	19,502	23	18	92.3
Van Buren county.....	36,022	40	30	83.3
SOUTHERN CENTRAL DIVISION.....	328,687	476	316	93.1
Branch county.....	25,514	24	19	74.5
Calhoun county.....	55,243	92	59	106.8
Hillsdale county.....	29,820	31	24	80.5
Jackson county.....	46,435	97	50	107.7
Kalamazoo county.....	53,170	106	61	114.7
Lenawee county.....	49,529	53	43	86.8
St. Joseph county.....	22,816	24	21	92.0
Washtenaw county.....	46,160	49	39	84.5
SOUTHEASTERN DIVISION.....	522,970	841	813	155.5
Macomb county.....	33,002	36	29	87.9
Monroe county.....	33,026	41	37	112.0
Oakland county.....	46,343	65	53	114.4
Wayne county.....	410,599	699	694	169.0

*†These footnotes are below Table 1, on a preceding page.

THE PREVALENCE OF PNEUMONIA IN URBAN AND RURAL LOCALITIES.

Of the 1,661 incorporated localities in Michigan in 1909, 897, or 54 per cent, were, at some time during the year, infected with pneumonia. These figures show that practically the same number were infected in 1908.

To determine what influence, if any, density of population has on the prevalence of pneumonia, the cities and villages have been divided into five groups shown in Table 3.

It will be seen that the death rate from pneumonia was very much higher in the cities having over 50,000 population and lowest in the townships or rural districts, which fact would indicate that the density of population has an influence on the prevalence of this disease.

By Table 3A, it may be seen that, in 1909, the urban localities which showed much higher death rates from pneumonia than the death rate for

this disease for the entire State for that year were: Battle Creek, Detroit, Flint, Grand Haven, Hancock, Ishpeming, Ludington, Menominee, Mt. Clemens, Muskegon, Pontiac and Wyandotte.

The localities, shown in Table 3A, in which the death rates from pneumonia were much lower in 1909 than the rate for the entire State for that year were: Alpena, Ann Arbor, Big Rapids, Cadillac, Calumet township, Charlotte, Escanaba, Houghton, Ironwood, Lansing, Laurium, Manistique, Marquette, Mt. Pleasant, Negaunee, Niles, Norway, Port Huron, St. Joseph, Sault Ste. Marie, Traverse City and Ypsilanti.

The localities, shown in Table 3A, which showed much higher death rates from pneumonia in 1909 than the average for such localities in the years 1904-1908, were: Adrian, Coldwater, Flint, Grand Haven, Hillsdale, Holland, Ionia, Mt. Clemens, Owosso and Wyandotte.

The localities, shown in Table 3A, which showed much lower death rates in 1909 than the average for such localities in the years 1904-1908, were: Albion, Alpena, Ann Arbor, Bay City, Big Rapids, Cadillac, Calumet township, Charlotte, Escanaba, Grand Rapids, Houghton, Jackson, Lansing, Laurium, Manistique, Marquette, Mt. Pleasant, Negaunee, Niles, Norway, Port Huron, St. Joseph, Sault Ste. Marie and Ypsilanti.

TABLE 3.—*The prevalence of pneumonia in urban and rural localities, in Michigan, in 1909.*

Localities—grouped according to density of population.	Population.*	Health jurisdictions.			Cases.†	Deaths.	Death rates per 100,000 of the population.
		Total.	Infected.				
			Number.	Per cent of all jurisdictions.			
Cities over 50,000.....	524,498	3	3	100	860	846	161.3
Cities from 25,000 to 50,000.....	154,255	5	5	100	191	132	85.6
Cities from 10,000 to 25,000 and Calumet township (18,628).....	222,289	16	16	100	266	199	89.5
Cities and villages from 5,000 to 10,000.....	185,982	28	28	100	223	169	90.9
Cities and villages under 5,000‡.....	352,905	325	177	54	369	274	77.6
Total urban.....	1,439,929	377	229	61	1,909	1,620	112.5
Balance of localities—principally townships §...	1,226,380	1,284	668	52	1,233	943	76.9

*†These footnotes are below Table 1, on a preceding page.

‡Exclusive of 57 cities and villages, for which the population in 1909 cannot be correctly estimated.

§Includes the 57 cities and villages mentioned in the preceding paragraph, but does not include Calumet township, which, for the purpose of this study, is included in the third group of urban localities, which have corresponding populations.

TABLE 3A.—*The deaths from pneumonia in 1909, and preceding years, in each of the principal localities included in the first four groups in Table 3.*

Localities.	1909.			Average, 1904-1908.		
	Population.*	Deaths.	Deaths per 100,000 inhabitants.	Population.*	Deaths.	Deaths per 100,000 inhabitants.
Adrian.....	11,963	14	117.0	11,193	9	80.4
Allion.....	5,473	4	73.1	5,155	7	135.8
Alpena.....	13,148	7	53.2	12,699	12	94.5
Ann Arbor.....	14,712	9	61.2	14,643	12	81.9
Battle Creek.....	26,776	33	123.2	24,038	28	116.5
Bay City.....	40,509	33	81.5	37,989	147	123.7
Benton Harbor.....	6,877	5	72.7	6,772	4	59.1
Big Rapids.....	5,060	1	19.8	4,935	7	141.8
Cadillac.....	8,013	3	37.4	7,341	7	95.4
Calumet township.....	18,628	11	59.1	17,813	20	112.3
Charlotte.....	5,519	3	54.4	5,043	7	138.8
Cheboygan.....	7,032	7	99.5	6,851	6	87.6
Coldwater.....	6,237	7	112.2	6,230	5	80.3
Detroit.....	366,646	720	196.4	338,435	586	173.1
Escanaba.....	13,035	6	46.0	11,873	22	185.3
Flint.....	17,111	33	192.9	15,775	21	133.1
Grand Haven.....	5,859	9	153.6	5,487	4	72.9
Grand Rapids.....	105,910	78	73.6	99,795	113	113.2
Hancock.....	8,521	11	129.1	7,030	12	170.7
Hillsdale.....	5,632	6	106.5	5,138	4	77.9
Holland.....	10,436	12	115.0	9,554	6	62.8
Houghton.....	5,581	2	35.8	4,839	4	82.7
Ionia.....	5,239	4	76.4	5,229	3	57.4
Iron Mountain.....	7,764	8	103.0	8,256	9	109.0
Ironwood.....	10,412	7	67.2	10,176	7	68.8
Ishpeming.....	9,583	16	167.0	10,807	15	138.8
Jackson.....	25,450	19	74.7	25,360	29	114.4
Kalamazoo.....	36,505	34	93.1	32,471	40	123.2
Lansing.....	25,015	13	52.0	22,172	17	76.7
Laurium.....	10,166	5	49.2	8,658	7	80.9
Ludington.....	7,376	10	135.6	7,306	9	123.2
Manistee.....	10,768	12	111.4	11,932	12	100.6
Manistique.....	5,184	1	19.3	4,831	5	103.5
Marquette.....	11,424	7	61.3	10,969	12	109.4
Menominee.....	8,944	12	134.2	10,235	15	146.6
Monroe.....	7,485	8	106.9	6,671	8	119.9
Mt. Clemens.....	7,773	13	167.2	7,374	9	122.1
Mt. Pleasant.....	5,512	2	36.3	4,895	3	61.3
Muskegon.....	20,995	26	123.8	20,937	29	138.5
Negaunee.....	6,625	2	30.2	6,728	5	74.3
Niles.....	5,084	1	19.7	4,819	3	62.3
Norway.....	5,732	1	17.4	5,211	6	115.1
Owosso.....	9,707	10	103.0	9,370	6	64.0
Petoskey.....	5,062	4	79.0	5,136	5	97.4
Pontiac.....	12,278	17	138.5	11,442	16	139.8
Port Huron.....	21,116	15	71.0	20,463	23	112.4
Saginaw.....	51,942	48	92.4	48,743	51	104.6
St. Joseph.....	5,551	2	36.2	5,406	3	55.5
Sault Ste. Marie.....	12,572	9	71.6	11,894	14	117.7
Traverse City.....	13,525	9	66.5	12,152	10	82.3
Wyandotte.....	5,728	16	279.3	5,546	11	198.3
Ypsilanti.....	7,849	1	12.7	7,692	6	78.0

*Estimated for intercensal years.

†Does not include West Bay City for 1904, which was consolidated with Bay City in 1905.

SEASONAL PREVALENCE.

Judging from the average number of persons who were taken sick in each month in the six years, 1904-1909, shown in Table 4, pneumonia was most prevalent in the month of February, and least prevalent in the month of August.

By the Secretary of State's Vital Statistics of Michigan, it appears that during the twelve years, 1898-1909, the greatest number of deaths from pneumonia occurred in the months of February and March, and the least number in August.

TABLE 4.—*The seasonal prevalence of pneumonia, in Michigan, as indicated by the average number of persons taken sick in each month in the six years, 1904-1909, and by the average number of deaths, from this disease, in each month in the twelve years, 1898-1909.*

Years.		Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904-1909	Average number of persons taken sick in each month*	443	477	405	352	274	108	68	52	88	139	214	286
1898-1909	Average number of deaths in each month†.....	339	384	382	319	241	118	71	58	77	118	175	250

*The months in which some of the cases began were not reported.

†The averages for the years, 1898-1903, are compiled from the Secretary of State's Vital Statistics of Michigan, and for the years, 1904-1909, from the Michigan Monthly Bulletin of Vital Statistics.

INFLUENCE OF AGE AND SEX.

The ages of those taken sick with pneumonia in the six years, 1904-1909, were stated in 20,244 instances.

In the case of those who died from pneumonia, the ages were stated in 16,406 instances, and of this number about 24 per cent were under one year; 37 per cent under five years; nine per cent between the ages of 5 and 24 years; 16 per cent between the ages of 25 and 49 years; 25 per cent between the ages of 50 and 74 years, and nearly 12 per cent 75 years and over.

The number and per cent of cases and deaths, by one-year periods from 0 to 5 years, by five-year periods from 5 to 75 years, and in one group for those over 75 years, are contained in Table 5.

The average age of non-fatal cases was for males 24.2 years, and for females 27.1 years.

The average age of fatal cases was for males 31.7 years, and for females 34.1 years.

Thirty-eight per cent of the males and 36 per cent of the females who died, and 18 per cent of the males and 19 per cent of the females who recovered, were under five years of age.

Ten per cent of the males and 14 per cent of the females who died, and two per cent of the males and three per cent of the females who recovered, were over 74 years of age.

Up to the fourth year, between the fifth and ninth years, and between the ages of 15 and 69 years, inclusive, the fatality was slightly higher in the males than in the females. At nearly all ages the recoveries were more numerous among males than females.

TABLE 5.—*The influence of age and sex in pneumonia, as indicated by the number of those of known ages, who died or recovered from this disease in the six years, 1904-1909. Arranged, by sex, in age periods of one year for those of from one to five years; in five year periods for those of from five to seventy-five years; and in one group for those of seventy-five years and over.*

Age periods.	Died.			Recovered.		
	Total deaths.			Total recoveries.		
	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.
0-1 years.....	2,292	1,654	3,946	89	64	153
1-2 years.....	1,687	1,005	2,692	76	74	150
2-3 years.....	235	211	446	77	67	144
3-4 years.....	110	128	238	85	65	150
4-5 years.....	81	90	171	68	43	111
Under five years.....	3,438	2,688	6,126	395	313	708
5-9 years.....	206	194	400	206	240	546
10-14 years.....	100	132	232	195	151	346
15-19 years.....	229	168	397	262	115	377
20-24 years.....	294	192	486	180	80	260
25-29 years.....	216	196	412	120	74	194
30-34 years.....	291	213	504	103	77	180
35-39 years.....	307	229	536	108	74	182
40-44 years.....	388	194	582	104	71	175
45-49 years.....	391	230	621	96	87	183
50-54 years.....	377	229	606	90	65	155
55-59 years.....	415	304	719	56	57	113
60-64 years.....	400	415	815	42	63	120
65-69 years.....	507	468	975	47	60	102
70-74 years.....	491	607	1,098	51	54	105
75 years and over.....	892	1,051	1,943	37	55	92
All ages.....	8,996	7,410	16,406	2,202	1,636	3,838
				57.37	42.63	100.00

TABLE 6.—*The duration of sickness in fatal and non-fatal cases of pneumonia, of known duration, during the six years, 1904-1909. Arranged by sex, in five day periods.*

Duration periods.	Fatal cases.				Non-fatal cases.							
	Number.			Per cent.	Number.			Per cent.				
	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.			
1 to 5 days.....	3,118	2,499	5,617	23.45	18.80	42.45	32	25	57	.99	.78	1.77
6 to 10 days.....	2,502	2,131	4,633	18.82	16.03	34.85	307	193	500	9.54	6.00	15.54
11 to 15 days.....	803	680	1,483	6.04	5.11	11.15	477	340	817	14.82	10.57	25.39
16 to 20 days.....	298	248	546	2.24	1.87	4.11	386	287	673	11.99	8.92	20.91
21 to 25 days.....	177	176	353	1.33	1.32	2.65	251	205	456	7.80	6.37	14.17
26 to 30 days.....	119	99	218	.90	.74	1.64	148	115	263	4.00	3.57	8.17
31 days and over.....	256	190	446	1.92	1.43	3.35	219	203	452	7.74	6.31	14.05
Totals.....	7,273	6,023	13,296	54.70	45.30	100.00	1,850	1,368	3,218	57.48	42.52	100.00

TABLE 7.—*Predisposing influences in pneumonia, as indicated by the manner in which the disease was reported to have begun in some of the cases in the six years, 1904-1909.*

Disease began as or followed.	Number of instances.	Disease began as or followed.	Number of instances.
Cold.....	3,104	Cholera infantum.....	9
Influenza.....	965	Operation.....	9
Bronchitis.....	532	Diphtheria.....	9
Exposure to inclement weather.....	399	Erysipelas.....	9
Measles.....	253	Spinal trouble.....	8
Heart trouble.....	251	Dropsy.....	7
Senility.....	242	Mitral insufficiency.....	7
Whooping-cough.....	189	Epilepsy.....	7
Kidney trouble.....	114	Sepsis.....	6
Asthma.....	103	Teething.....	6
Pleurisy.....	98	Malarial fever.....	6
Alcoholism.....	75	Otitis media.....	6
Bowel trouble.....	70	Cancer.....	6
General debility.....	64	Injury to ribs.....	6
Confinement.....	62	Insanitary conditions.....	5
Meningitis.....	60	Syphilis.....	5
Stomach trouble.....	53	Non-acclimated.....	4
Tuberculosis.....	51	Eclampsia.....	4
Rheumatism.....	50	Mumps.....	4
Traumatism.....	42	Chicken-pox.....	4
Paralysis.....	36	Morphine habit.....	3
Convulsions.....	28	Scarlet fever.....	3
Tonsillitis.....	27	Ricketts.....	3
Liver trouble.....	25	Hiccough.....	2
Abscess.....	25	Uremia.....	2
Typhoid fever.....	24	Dust on lungs.....	2
Mal-nutrition.....	23	Catarrhal fever.....	2
Marasmus.....	19	Eczema.....	2
Lung trouble.....	18	Adenoids.....	1
Croup.....	18	Atmospheric conditions.....	1
Apoplexy.....	17	Anaesthesia.....	1
Brain trouble.....	15	Change of life.....	1
Peritonitis.....	14	Strangulation of hernia.....	1
Miscarriage.....	11	Eye trouble.....	1
Throat trouble.....	10	Thrush.....	1
Diabetis.....	10	Gangrene.....	1
Anaemia.....	10	Puerperal fever.....	1
Appendicitis.....	10	Pyemia.....	1

DURATION OF FATAL AND NON-FATAL CASES.

The average duration of fatal cases was for males 8.2 days, and for females 8.3 days.

The average duration of non-fatal cases was for males 18.1 days and for females 18.6 days.

Of the fatal cases the greatest number of deaths, both male and female, occurred between the first and eleventh days; the next greatest before the sixteenth day, and the next before the twenty-first day.

Of the non-fatal cases the greatest number of recoveries, both male and female, took place between the tenth and twenty-first days.

The per cent of deaths and recoveries, both male and female, in five-day periods, is shown in Table 6.

PREDISPOSING INFLUENCES.

In reply to the question, "What sickness or other predisposing influence preceded this case?" 3,104 cases were reported as having followed a cold; 965 cases following influenza; 532 cases following bronchitis, and 399 cases following exposure to inclement weather.

REPORTED SOURCES OF CONTAGIUM.

Owing to the fact that great difficulty is experienced in tracing cases of pneumonia to their source, this information is necessarily very meagre, and, probably, unreliable, therefore the compilation of the source of contagium, in this disease, was discontinued in 1908. Table 8, which contains the information gathered during the period of four years, 1904-7, is reprinted for the benefit of those who wish to make a study of the subject in connection with Table 7.

TABLE 8.—*Reported sources of contagium in pneumonia, in Michigan, in the four years, 1904-1907.*

Sources.	Number of instances.
Traced to a former case in same jurisdiction.....	157
From outside jurisdictions.....	8
Foreign bodies in bronchial tubes.....	3
Handling mail.....	1
Not stated, or statements doubtful.....	14,211

PERIOD OF INCUBATION.

By reason of the difficulty experienced in locating individual sources of contagium and, by this means, the time of exposure to pneumonia, the period of incubation is not easy to determine. As indicating the probable average period of incubation in the six years, 1904-1909, it may be stated that, in the majority of instances, the time which elapsed between certain cases and recent previous cases in the same households was from one to eight days, the maximum number of cases having occurred on the second and seventh days.

The period of time which elapsed between the occurrence of three hundred and ninety-two cases in the same households, in the six years, 1904-1909, is shown in Table 9. The table may also be of service in studying the questions of *communicability* in pneumonia, and the *susceptibility*, to future attacks, of persons who have once had the disease.

TABLE 9.—*The COMMUNICABILITY of pneumonia as probably indicated by the number of contemporary cases in the same households; the PERIOD OF INCUBATION in pneumonia, as probably indicated by the time which elapsed between the occurrence of certain cases of this disease and recent previous cases in the same household; and the SUSCEPTIBILITY of certain persons to pneumonia, as probably indicated by the number of instances in which second and even third, attacks occurred in the same persons, in Michigan, in the six years, 1904-1909**

Time of occurrence of secondary cases in the same household.	Number of instances.	Time of occurrence of secondary cases in the same household.	Number of instances.
About same time.....	52	Twenty-seven days.....	3
Twelve hours.....	1	One month.....	16
One day.....	12	One month and fifteen days.....	4
Two days.....	18	Two months.....	8
Three days.....	14	Three months.....	*7
Four days.....	17	Four months.....	10
Five days.....	11	Five months.....	1
Six days.....	10	Seven months.....	2
Seven days.....	18	Eight months.....	1
Eight days.....	9	Nine months.....	*1
Nine days.....	6	Ten months.....	1
Ten days.....	5	Eleven months.....	1
Eleven days.....	7	One year.....	†31
Twelve days.....	3	One year and two months.....	2
Thirteen days.....	5	One year and three months.....	2
Fourteen days.....	3	One year and six months.....	1
Fifteen days.....	2	One year and seven months.....	*3
Sixteen days.....	3	Two years.....	‡16
Nineteen days.....	2	Three years.....	8
Twenty-one days.....	3	Three years and six months.....	1
Twenty-two days.....	1	Four years.....	*4
Twenty-three days.....	1	Five years.....	§7
Twenty-four days.....	1	Time not stated.....	57
Twenty-six days.....	1		

*In one instance a second attack in the same person.

†In four instances a second attack in the same person.

‡In three instances a second attack in the same person.

§In one instance, a second attack, and in another instance, a third attack, in the same person in the five years.

INFLUENCE OF OCCUPATION.

The occupations of pneumonia patients in the six years, 1904-1909, were given in 9,315 instances.

Heading the list are those engaged in housework—housewives, housekeepers and domestics—to the number of 3,331, many of whom spend a considerable portion of their time in ill-ventilated and dust-laden rooms. Dirt—often contaminated with infected sputum—carried into the home on the shoes and skirts, and disseminated throughout the rooms by air currents, or by the periodical sweeping and dusting, is generally believed to play a very important part in the spread of pneumonia, and other diseases of the respiratory organs.

Next in order is the farming class, to the number of 2,002, who, though naturally a hardy race, seem to be very susceptible to this disease.

Next in order is the laboring class, with 1,154 cases; and next to them the student class—principally young children of school age—with 555 cases.

In the five years, 1905-1909, there were 5,561 cases where the ages of the patients were given as under five years, therefore no occupation was given, and they were still too young to attend school, so could not be included in the student class.

A complete list of occupations of pneumonia patients, as reported in the six years, 1904-1909, may be found in Table 10.

TABLE 10.—*The influence of occupation in pneumonia, in the six years, 1904-1909.*

Occupations.	Number of instances.	Occupations.	Number of instances.	Occupations.	Number of instances.
Housewife.....	3,331	Mason.....	18	Veterinarian.....	4
Farmer.....	2,002	Legal profession.....	17	Street car conductor.....	3
Laborer.....	1,154	Printer.....	16	Marine engineer.....	3
Student.....	555	Tailor.....	15	Inspector.....	3
Mechanic.....	397	Cigarmaker.....	15	Theatrical man.....	3
Miner.....	255	Machinist.....	13	Cattle buyer.....	2
Clerk.....	222	Harnessmaker.....	13	Chauffeur.....	2
Merchant.....	200	Musician.....	12	Motorman.....	2
Teamster.....	99	Nightwatch.....	11	Soldier.....	2
Railroad man.....	92	Hotel keeper.....	11	Surface foreman.....	2
Painter and paperhanger...	64	Liveryman.....	11	Messenger.....	2
Woodsman.....	54	Tinner.....	11	Hair dresser.....	2
School teacher.....	54	Fisherman.....	11	Stone cutter.....	2
Agent.....	52	Mail carrier.....	10	Bookbinder.....	2
Factory employee.....	52	Policeman.....	9	Carpet weaver.....	2
Saloon man.....	39	Washerwoman.....	9	Buttermaker.....	1
Minister.....	36	Plumber.....	9	Beanpicker.....	1
Physician.....	33	Baker.....	9	Well digger.....	1
Dressmaker and milliner...	32	Lineman.....	9	Architect.....	1
Sailor.....	32	Engineer.....	8	Elevator boy.....	1
Lumberman.....	29	Waiter.....	8	Plasterer.....	1
Shoemaker.....	25	Real estate man.....	6	Upholsterer.....	1
Contractor.....	24	Peddler.....	6	Trapper.....	1
Gardener and florist.....	23	Hotel porter.....	6	Ice cream maker.....	1
Cook.....	22	Fireman.....	6	Race horse man.....	1
Nurse.....	20	Cooper.....	6	Ice man.....	1
Butcher.....	19	Laundryman.....	4	Chemist.....	1
Miller.....	19	Dentist.....	4	Salt packer.....	1
Janitor.....	19	Nun.....	4	Photographer.....	1
Barber.....	18	Attendant in prison or asylum.....	4	Feather renovator.....	1

RESTRICTIVE AND PREVENTIVE MEASURES.

By reference to Table 11, it may be seen that of the total number of cases of pneumonia in the six years, 1904-1909, but 6,276, or 30 per cent, were isolated from all persons except nurses and attending physicians; that in 8,031 instances, or 40 per cent of the whole number, the sputa was disinfected, and that in 11,000 instances, or 53 per cent of the whole number, the rooms occupied by the patients were disinfected. The enforcement of the restrictive and preventive measures for the year 1909 shows a slight improvement over that of former years.

As previously stated, in a large number of instances, this Department received its first information of cases of pneumonia through the death returns, and, in many instances, the health officials had no knowledge of these cases until notified of the same by this Department, when, of course, it would be too late to carry out the restrictive and preventive measures. This fact will account, to a considerable extent, for the comparatively small number of cases in which precautions were taken.

TABLE 11.—*Restrictive and preventive measures in pneumonia, in Michigan, in the six years, 1904-1909.*

Restrictive and preventive measures.	Number of instances.	Per cent.
ISOLATION:		
Enforced.....	6,276	30
Neglected.....	4,709	23
Not stated, or statements doubtful.....	9,714	47
DISINFECTION OF SPUTA:		
Enforced.....	8,031	*40
Neglected.....	2,024	*10
Not stated, or statements doubtful.....	10,093	*50
DISINFECTION OF BEDDING, CLOTHING, ETC., SOILED BY SPUTA:		
Enforced.....	11,192	*56
Neglected.....	2,025	*10
Not stated, or statements doubtful.....	6,931	*34
DISINFECTION OF ROOM OCCUPIED BY PATIENT:		
Enforced.....	11,000	53
Neglected.....	3,135	15
Not stated, or statements doubtful.....	6,564	32

*In 551 instances the reports stated that there was no sputa, therefore this number has been deducted from the total number of cases before making the per cent.

TUBERCULOSIS IN MICHIGAN IN 1909 AND PRECEDING YEARS.

GENERAL PREVALENCE.

During the year 1909 tuberculosis was reported present in 874 incorporated health jurisdictions in this State, with an aggregate of 3,423 cases, including 2,465 deaths. By Table 12 it may be seen that the number of cases in 1909 was 27 per cent greater than in 1908. This fact is doubtless due to the new law which became operative in June, 1909, requiring physicians to report all cases of tuberculosis which come under their observation.

By reason of the fact that many cases of this disease are of long duration, and in some stages of the disease not under the care of a physician, the number of cases reported to this Department are believed to be considerably less than the actual number in existence. The above reason is also given for the high rate of deaths to cases.

The compilation of information relative to the prevalence of tuberculosis in Michigan was made for the first time in 1893, but from that time to 1898, when the new law for the registration of deaths took effect, the reports of cases and deaths were much less than the actual number occurring. Hence the reason for commencing Table 12 with the year 1898.

TABLE 12.—*The prevalence of tuberculosis, in Michigan in each of the twelve years, 1898-1909.*

Years.	Population.*	Number of cases.†	Number of deaths.	Deaths per 100,000 population.
1898.....	2,389,393	3,041	2,728	114.2
1899.....	2,426,331	2,975	2,516	103.7
1900.....	2,420,982	2,721	2,221	91.7
1901.....	2,448,241	2,915	2,344	95.7
1902.....	2,475,499	2,658	2,185	88.3
1903.....	2,502,758	2,745	2,319	92.7
1904.....	2,530,016	2,928	2,515	99.4
1905.....	2,557,275	2,590	2,464	96.4
1906.....	2,584,533	2,653	2,502	96.8
1907.....	2,611,792	2,699	2,496	95.6
1908.....	2,639,050	2,705	2,512	95.2
1909.....	2,666,309	3,423	2,465	92.4
Average per year.....	2,521,015	2,838	2,439	96.7

*Estimated for intercensal years.

†From Detroit, and many other localities, only the fatal cases were reported, therefore the figures in this column do not represent the number of cases that actually occurred.

The number of deaths from pulmonary tuberculosis per 100,000 persons living, reported to the Secretary of State during the twenty-nine years ending with 1897 (Table 13), probably quite accurately represents the annual

fluctuations of, but not the total deaths from, this disease. It may be seen that, compared with any previous year, there was a remarkable and unprecedented decrease in the death rate from tuberculosis in 1891. This decrease is probably due to the "campaign of education" as to the restriction and prevention of this disease, which began in 1880, and which, apparently, began to show results in 1891.

TABLE 13.—*The number of reported deaths from tuberculosis of the lungs per 100,000 persons living, in Michigan, in each of the twenty-nine years 1869-1897. Compiled from the Secretary of State's Vital Statistics of Michigan.*

Year.	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
Deaths.....	108.1	122.5	106.0	115.1	109.6	102.0	104.9	109.2	110.9	106.1	105.6	111.7
Year.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Deaths.....	116.1	104.4	112.3	120.8	105.3	107.3	108.7	121.0	104.3	105.4	96.3	95.2
Year.	1893.	1894.	1895.	1896.	1897.	Average, 1869-1897.						
Deaths.....	97.7	98.4	105.1	90.4	80.6	106.2						

GEOGRAPHICAL DISTRIBUTION.

By Table 14 it may be seen that, as compared with the average death rate for tuberculosis for the entire State (96.7 deaths per 100,000 inhabitants), the disease was much more prevalent than usual in the counties of Luce, Mackinac, Grand Traverse, Roscommon and Wayne.

In a lesser degree the disease was more prevalent than usual in the counties of Baraga, Delta, Houghton, Marquette, Leelanau, Benzie and Kent.

The disease was much less prevalent than usual in the counties of Alger, Iron, Schoolcraft, Crawford, Otsego, Ogemaw, Oscoda, Presque Isle, Clare Gladwin, Missaukee, Osceola, Arenac and Barry.

TABLE 14.—*The geographical distribution of tuberculosis, in Michigan, in the twelve years, 1898-1909, as indicated by the average number of cases and deaths, and the average deaths per 100,000 persons living, in each geographical division, shown in the table.*

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
UPPER PENINSULAR DIVISION.....	270,717	339	279	103.1
Alger county.....	6,374	4	3	47.1
Baraga county.....	5,265	6	6	114.0
Chippewa county.....	21,693	24	22	101.4
Delta county.....	26,804	36	30	111.9
Dickinson county.....	18,479	19	17	92.0
Gogebic county.....	16,992	16	15	88.3
Houghton county.....	68,340	106	80	117.1
Iron county.....	8,775	9	6	68.4
Keweenaw county.....	4,352	5	4	91.9
Luce county.....	3,700	5	5	135.1
Mackinac county.....	8,024	12	11	137.1
Marquette county.....	39,910	57	46	115.3
Menominee county.....	26,176	22	21	80.2
Ontonagon county.....	7,133	11	7	98.1
Schoolcraft county.....	8,700	7	6	69.0
NORTHWESTERN DIVISION.....	91,611	119	96	104.8
Benzie county.....	10,981	13	12	109.3
Grand Traverse county.....	23,318	43	31	132.9
Leelanau county.....	10,911	14	13	119.1
Manistee county.....	27,279	32	26	95.3
Wexford county.....	19,122	17	14	73.2
NORTHERN DIVISION.....	83,954	80	69	82.2
Antrim county.....	15,400	15	13	84.4
Charlevoix county.....	15,903	17	15	94.3
Cheboygan county.....	17,237	15	13	75.4
Crawford county.....	3,706	3	2	54.0
Emmet county.....	17,248	19	16	92.8
Kalkaska county.....	7,420	7	6	80.9
Otsego county.....	7,040	4	4	56.8
NORTHEASTERN DIVISION.....	60,560	49	44	72.7
Alcona county.....	5,641	6	5	88.6
Alpena county.....	19,966	16	15	75.1
Iosco county.....	10,330	10	9	87.1
Montmorency county.....	3,543	3	3	84.7
Ogemaw county.....	8,692	7	6	69.0
Oscoda county.....	1,900	2	1	52.6
Presque Isle county.....	10,488	5	5	47.7
WESTERN DIVISION.....	279,516	345	279	99.8
Kent county.....	138,897	196	150	108.0
Lake county.....	5,039	5	5	99.2
Mason county.....	19,868	22	19	95.6
Muskegon county.....	36,896	46	38	103.0
Newaygo county.....	18,363	14	14	76.2
Oceana county.....	17,811	16	15	84.2
Ottawa county.....	42,642	46	38	89.1
NORTHERN CENTRAL DIVISION.....	107,635	95	82	76.2
Clare county.....	9,152	7	6	65.6
Gladwin county.....	8,326	6	5	60.1
Isabella county.....	24,297	25	21	86.4
Mecosta county.....	20,445	20	18	88.0
Midland county.....	14,901	13	12	80.5
Missaukee county.....	10,172	6	5	49.2
Osceola county.....	18,700	16	13	69.5
Roscommon county.....	1,642	2	2	121.8

*†These footnotes are below Table 12, on a preceding page.

TABLE 14.—CONCLUDED.

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
BAY AND EASTERN DIVISION.....	348,517	312	286	82.1
Arenac county.....	9,918	5	5	50.4
Bay county.....	64,120	62	58	90.5
Huron county.....	35,274	30	28	79.4
Lapeer county.....	27,231	25	21	77.1
Saginaw county.....	85,417	77	72	84.3
Sanilac county.....	34,948	33	29	83.0
St. Clair county.....	55,542	47	43	77.4
Tuscola county.....	36,067	33	30	83.2
CENTRAL DIVISION.....	316,847	336	276	87.1
Barry county.....	22,237	21	16	72.0
Clinton county.....	25,345	23	20	79.0
Eaton county.....	31,023	36	30	96.7
Genesee county.....	42,696	47	39	91.3
Gratiot county.....	30,330	31	28	91.3
Ingham county.....	43,728	40	32	73.2
Ionia county.....	35,069	41	34	97.0
Livingston county.....	18,762	27	17	90.6
Montcalm county.....	33,748	32	28	83.0
Shiawassee county.....	33,909	38	32	94.1
SOUTHWESTERN DIVISION.....	143,410	156	132	92.0
Allegan county.....	39,045	41	34	87.1
Berrien county.....	49,603	57	49	98.8
Cass county.....	20,175	23	19	94.2
Van Buren county.....	34,587	35	30	86.7
SOUTHERN CENTRAL DIVISION.....	324,759	390	307	94.5
Branch county.....	26,109	28	23	88.1
Calhoun county.....	53,172	54	49	92.2
Hillsdale county.....	29,834	31	27	90.5
Jackson county.....	47,192	48	43	91.1
Kalamazoo county.....	49,567	86	53	106.9
Lenawee county.....	49,094	47	42	85.6
St. Joseph county.....	23,419	28	23	98.2
Washtenaw County.....	46,372	68	47	101.4
SOUTHEASTERN DIVISION.....	493,500	619	586	118.7
Macomb county.....	33,069	39	35	105.8
Monroe county.....	33,140	36	31	93.5
Oakland county.....	45,602	55	45	98.7
Wayne county.....	381,689	489	475	124.4

*†These footnotes are below Table 12, on a preceding page.

THE PREVALENCE OF TUBERCULOSIS IN URBAN AND RURAL LOCALITIES.

By reference to Table 15, it may be seen that, in 1909, as indicated by the death rates, tuberculosis was most prevalent in the large centers of population, particularly in the cities from 10,000 to 25,000 inhabitants, and cities of 50,000 and over. In the cities from 25,000 to 50,000, the cities and villages under 5,000, and in the rural localities the death rate was less than the death rate for the entire State for that year.

By Table 15A, it is shown that, in 1909, the urban localities that showed much higher death rates from tuberculosis than the death rate for this disease for the entire State for that year were: Alpena, Benton Harbor, Calumet township, Detroit, Iron Mountain, Ironwood, Kalamazoo, Marquette, Menominee, Muskegon, Niles, Norway, Petoskey, Pontiac, Sault Ste. Marie, Traverse City and Wyandotte.

The localities, shown in Table 15A, in which the death rates from tuberculosis were much lower in 1909 than the rate for the entire State for that year were: Bay City, Hancock, Holland, Ionia, Lansing, Ludington, Manistique, Mt. Clemens and Port Huron.

The localities, shown in Table 15A, which showed much higher death rates from tuberculosis in 1909 than the average for such localities in the years, 1904-1908, were: Adrian, Albion, Alpena, Benton Harbor, Calumet township, Iron Mountain, Ironwood, Menominee, Norway, Pontiac, St. Joseph, Wyandotte and Ypsilanti.

The localities, shown in Table 15A, which showed much lower death rates from tuberculosis in 1909 than the average for such localities for the years, 1904-1908, were: Ann Arbor, Battle Creek, Bay City, Big Rapids, Charlotte, Escanaba, Hancock, Hillsdale, Holland, Ionia, Jackson, Manistee, Manistique, Mt. Clemens and Traverse City.

TABLE 15.—*The prevalence of tuberculosis in urban and rural localities, in Michigan, in 1909.*

Localities—Grouped according to density of population.	Population.*	Health jurisdictions.			Cases.†	Deaths.	Death rates per 100,000 of the population.
		Total.	Infected.				
			Number.	Per cent of all jurisdictions.			
Cities over 50,000.....	524,498	3	3	100	796	589	112.3
Cities from 25,000 to 50,000.....	154,255	5	5	100	244	136	88.0
Cities from 10,000 to 25,000 and Calumet township (18,628).....	222,289	16	16	100	438	268	120.6
Cities and villages from 5,000 to 10,000.....	185,982	28	28	100	277	197	105.9
Cities and villages under 5,000‡.....	352,905	325	187	58	428	306	86.7
Total urban.....	1,439,929	377	239	63	2,183	1,496	103.9
Balance of localities—principally townships§....	1,226,380	1,284	635	49	1,240	969	79.0

*†These footnotes are below Table 12, on a preceding page.

‡Exclusive of 57 cities and villages, for which the population in 1909 cannot be correctly estimated.

§Includes the 57 cities and villages mentioned in the preceding paragraph, but does not include Calumet township, which, for the purpose of this study, is included in the third group of urban localities, which have corresponding populations.

TABLE 15A.—*The deaths from tuberculosis in 1909, and in preceding years, in each of the principal localities included in the first four groups in Table 15.*

Localities.	1909.			Average, 1904-1908.		
	Population.*	Deaths.	Deaths per 100,000 inhabitants.	Population.*	Deaths.	Deaths per 100,000 inhabitants.
Adrian	11,963	12	100.3	11,193	8	71.5
Albion	5,473	6	109.6	5,155	4	77.6
Alpena	13,148	18	136.9	12,699	9	70.9
Ann Arbor	14,712	15	102.0	14,643	20	136.6
Battle Creek	26,776	21	78.4	24,038	27	112.3
Bay City	40,509	27	66.7	37,989	138	100.0
Benton Harbor	6,877	13	189.0	6,772	10	147.7
Big Rapids	5,060	4	79.1	4,935	6	121.6
Cadillac	8,013	6	74.9	7,341	6	81.7
Calumet township	18,628	39	209.4	17,813	22	123.5
Charlotte	5,519	4	72.5	5,043	6	119.0
Cheboygan	7,032	6	85.3	6,851	5	73.0
Coldwater	6,237	6	96.2	6,230	5	80.3
Detroit	366,646	424	115.6	338,435	419	123.8
Escanaba	13,035	13	99.7	11,873	22	185.3
Flint	17,111	19	111.0	15,775	15	95.1
Grand Haven	5,859	5	85.3	5,487	6	109.3
Grand Rapids	105,910	106	100.1	99,795	104	104.2
Hancock	8,521	4	46.9	7,030	11	156.5
Hillsdale	5,632	4	71.0	5,138	6	116.8
Holland	10,436	4	38.3	9,554	11	115.1
Houghton	5,581	4	71.7	4,839	4	82.7
Ionia	5,239	3	57.3	5,229	7	133.9
Iron Mountain	7,764	12	154.6	8,256	9	109.0
Ironwood	10,412	13	124.9	10,176	8	78.6
Ishpeming	9,583	11	114.8	10,807	16	148.1
Jackson	25,450	24	94.3	25,360	32	126.2
Kalamazoo	36,505	49	134.2	32,471	41	135.5
Lansing	25,015	15	60.0	22,172	15	67.7
Laurium	10,166	8	78.7	8,658	8	92.4
Ludington	7,376	5	67.8	7,306	4	54.7
Manistee	10,768	9	83.6	11,932	18	150.9
Manistiquette	5,184	3	57.9	4,831	5	103.5
Marquette	11,424	14	122.5	10,969	16	145.9
Menominee	8,944	14	156.5	10,235	9	87.9
Monroe	7,485	8	106.9	6,671	6	89.9
Mt. Clemens	7,773	5	64.3	7,374	11	149.2
Mt. Pleasant	5,512	4	72.6	4,895	4	81.7
Muskegon	20,995	26	123.8	20,937	26	124.2
Negaunee	6,625	7	105.7	6,728	9	133.8
Niles	5,084	7	137.7	4,819	6	124.5
Norway	5,732	8	139.6	5,211	4	76.8
Owosso	9,707	11	113.3	9,370	10	106.7
Petoskey	5,062	6	118.5	5,136	6	116.8
Pontiac	12,278	25	203.6	11,442	17	148.6
Port Huron	21,116	13	61.6	20,463	14	68.4
Saginaw	51,942	59	113.6	48,743	47	96.4
St. Joseph	5,531	6	108.5	5,406	4	74.0
Sault Ste. Marie	12,572	16	127.3	11,894	15	126.1
Traverse City	13,525	24	177.4	12,152	29	238.6
Wyandotte	5,728	16	279.3	5,546	8	144.2
Ypsilanti	7,849	9	114.7	7,692	7	91.0

*Estimated for intercensal years.

†Does not include West Bay City for 1904, which was consolidated with Bay City in 1905.

THE SEASONAL PREVALENCE OF TUBERCULOSIS.

As a rule, tuberculosis in the early stages, is not recognized, and consequently the time of its inception is not generally known or reported. This,

coupled with the fact that regular reports of the progress of many cases are lacking, renders it difficult to determine, with any degree of accuracy, the seasonal prevalence of the disease. Table 16 is therefore designed to take the place of a table showing the seasonal prevalence. The months of greatest fatality, named in the order of the greatest number of deaths, were April, May and March; the months of least fatality, being from July to September, inclusive.

TABLE 16.—*The seasonal fatality from tuberculosis, in Michigan, as shown by the average number of deaths from this disease in each month in the sixteen years, 1894-1909.*

Months.....	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average number of deaths.....	167	171	185	190	187	158	150	149	143	158	154	168

LOCATION OF THE DISEASE IN TUBERCULOSIS.

The location of the disease in tuberculous persons for the period of fifteen years, ending in 1909, is shown in Table 17. With a view to aiding this study, the body has been divided into five divisions, as follows: Cranial cavity, spine, thoracic cavity, abdominal cavity and joints. As may be seen by the above mentioned table, the disease was located in the thoracic cavity in nearly seven times as many instances as in all the other divisions combined, and of the organs of the thoracic cavity, the disease was located in the lungs in thirty-two times as many instances as in all the other organs of that cavity combined.

Usually the disease was located in more than one part of the body, and in many instances several different organs or parts, at the same time.

TABLE 17.—*Location of the disease in tuberculous persons, in Michigan, during the fifteen years, 1895-1909.*

Part of the body.		Number of instances.
Cranial cavity (meninges and membranes).....		68
Spine (cord and membranes).....		95
Thoracic cavity.....	Pharynx.....	10
	Larynx.....	305
	Bronchi.....	112
	Lungs.....	22,199
	Pleura.....	27
	Instances in which the location of the disease was not definitely specified.	261
	Stomach.....	221
	Liver.....	90
	Kidneys.....	115
	Spleen.....	7
Abdominal cavity.....	Bladder.....	40
	Intestines.....	1,300
	Peritoneum.....	297
	Instances in which the location of the disease was not definitely specified.	117
	Shoulder.....	3
	Elbow.....	2
Joints.....	Hip.....	90
	Knee.....	33
	Joints not specified.....	14
Instances in which the disease was located in the tissues or other parts of the body but not definitely specified.....		920

REPORTED SOURCES OF CONTAGIUM.

The difficulty experienced in tracing cases of tuberculosis to their source is nowhere better illustrated than in the very small number of reports received at this office from year to year which throw any light upon this phase of the study of tuberculosis, and it is probable that, in many instances, where a source is reported, the information is based upon circumstantial evidence, only. From the reports of tuberculosis in 1907-1909 it is learned that 371 cases were traced to former cases of the disease, and that, in 1,049 instances, the patients had tuberculous relatives or associates.

In reply to the question, "Can you trace any other case of consumption or tuberculosis to this case?" the health officers answered "Yes" in 36 instances.

PREDISPOSING INFLUENCES AND PREMONITORY SYMPTOMS.

For the reason that very many cases of tuberculosis are not recognized or reported until the advanced stage has been reached, the information contained in past reports relative to the predisposing influences and premonitory symptoms in tuberculosis was, necessarily, very meagre and, probably, not entirely reliable. Since 1905, information along these lines was not asked for, but Table 18, which contains the information obtained during a period of nine years, is reprinted for the benefit of those who wish to make a study of the subject in connection with Table 7 in the preceding article on pneumonia. By a comparison of these tables, it may be seen that the predisposing influences are, practically, the same in tuberculosis as in pneumonia, and that both the tables emphasize the necessity for the "ounce of prevention" in the prompt and thorough treatment of a cold or cough, and in the institution of restrictive and preventive measures in cases of influenza, bronchitis, typhoid fever, measles, whooping-cough, etc.

TABLE 18.—*Predisposing influences and premonitory symptoms in SOME OF THE CASES OF tuberculosis in Michigan, in the nine years, 1897-1905.*

Disease began with or followed.	No. of instances.	Disease began with or followed.	No. of instances.	Disease began with or followed.	No. of instances.
Cough and cold.....	4,597	Fistula.....	5	Blood poisoning.....	1
Influenza.....	1,197	Heart trouble.....	5	Dropsy.....	1
Bronchitis.....	969	Scrofula.....	4	Ulceration of cornea.....	1
Pneumonia.....	634	Change of life.....	4	Aphonia.....	1
Homorrhage.....	622	Hay fever.....	4	Insomnia.....	1
General debility.....	305	Typhoid pneumonia.....	4	Womb trouble.....	1
Pleurisy.....	87	Headache.....	4	Overexertion.....	1
Typhoid fever.....	67	Profuse expectoration.....	4	Complication of diseases.....	1
Catarrh.....	67	Pain in abdomen.....	4	Pain in shoulder.....	1
Bowel, stomach and intes- tinal trouble.....	60	Dyspepsia.....	3	Pus-infected hand.....	1
Measles.....	53	Marasmus.....	3	Tape worm.....	1
Asthma.....	39	Tubercular glands.....	3	Pelvic cellulitis.....	1
Child birth.....	38	Swelling in neck.....	3	Hardening of lungs.....	1
Fever.....	35	Swelling of limbs.....	3	Softening of brain.....	1
Diarrhea.....	34	Scarlet fever.....	3	Appendicitis.....	1
Abscess.....	32	Tonsilitis.....	3	Cholera infantum.....	1
Throat trouble.....	31	Paralysis.....	3	Ulceration of rectum.....	1
Malarial fever.....	29	Night sweats.....	3	Brain fever.....	1
Whooping-cough.....	26	Gangrene of lungs.....	2	Enlargement of spleen.....	1
Rheumatism.....	22	Pharyngitis.....	2	Result of operation.....	1
Glandular affection.....	20	Lupus on face.....	2	Cancer.....	1
Kidney and bladder trouble.	13	Extreme nervousness.....	2	Pain in breast.....	1
Pain in side.....	12	Lumbago.....	2	Diphtheria.....	1
Laryngitis.....	9	Curvature of spine.....	2	Sore mouth.....	1
After miscarriage.....	8	Tumor.....	2	Result of vaccination.....	1
Suppression of menses.....	8	Diabetes.....	2	Peritonitis.....	1
Injury.....	8	Inhalation of dust.....	2	Pain in rectum.....	1
Anemia.....	7	Pott's disease.....	2	Coughed up a pin which had been swallowed in childhood.....	1
Liver trouble.....	6	Empyema.....	2	Choking and filling up.....	1
		Cigarette smoking.....	2		

INFLUENCE OF AGE AND SEX IN TUBERCULOSIS.

Table 19 indicates that the greatest number of those of both sexes who died or recovered from tuberculosis were between the ages of twenty and thirty years. From infancy up to the age of thirty there was a gradual increase, and from the ages of thirty to eighty years there was a gradual decrease in the number of those who died or recovered. Of those who died between the ages of one and forty years, the greater number were females, and of those who recovered between the ages of ten and forty years, the greater number were also females. Of those who died between the ages of forty

and eighty years, the greater number were males, which is also true of those who recovered between the ages of forty and seventy years. At all ages the females constituted about 54 per cent of those who died.

The average age of fatal cases in the sixteen years, 1894-1909, was for males 36.4, and for females 32.8 years.

The average age of non-fatal cases in the sixteen years, 1894-1909 was for males 32.4 and for females 29.2 years.

TABLE 19.—*The influence of age and sex in tuberculosis, as indicated by the number of those of known ages who died or recovered from this disease, in Michigan, in the sixteen years, 1894-1909. Arranged by sex, in age periods of ten years each.*

Age periods.	Died.						Recovered.		
	Number.			Per cent.			Number.		
	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.
Under 10 years.....	522	576	1,098	1.70	1.88	3.58	4	2	6
10 to 19 years.....	1,240	2,415	3,655	4.05	7.88	11.93	11	16	27
20 to 29 years.....	4,107	5,435	9,542	13.41	17.74	31.15	16	23	39
30 to 39 years.....	2,929	3,504	6,433	9.56	11.44	21.00	13	24	37
40 to 49 years.....	2,147	1,882	4,029	7.01	6.14	13.15	12	6	18
50 to 59 years.....	1,589	1,148	2,737	5.18	3.75	8.93	8	3	11
60 to 69 years.....	1,066	940	2,006	3.48	3.06	6.54	3	1	4
70 to 79 years.....	538	447	985	1.76	1.46	3.22	.....	2	2
80 years and over.....	68	83	151	.23	.27	.50	.....	.....	.....
All ages.....	14,206	16,430	30,636	46.38	53.62	100.00	67	77	144

INFLUENCE OF COLOR IN TUBERCULOSIS.

In Table 20, it is shown that, according to the proportion of white and colored persons in the population, tuberculosis was more prevalent among the colored population.

Of the colored population, the disease was most prevalent among the Indians.

TABLE 20.—*The color of some of the tuberculous persons, in Michigan, reported during the fifteen years, 1895-1909.*

Color.	Number of instances in which the color was stated.	Per cent.	Approximate proportion of the total population of the State.—Expressed in per cents.
White.....	30,141	96.71	99.08
Black (Negro).....	589	1.89	.64
Red (Indian).....	433	1.39	.26
Yellow (Japanese).....	2	.01	.....

CIVIL CONDITION OF TUBERCULOUS PERSONS.

During the years 1895-1909, the reports of cases in which the civil condition of the patients was stated, showed that 58 per cent of the patients were or had been married, and that 42 per cent were single.

INFLUENCE OF OCCUPATION IN TUBERCULOSIS.

What has been said in the preceding article, relative to the influence of occupation in pneumonia, will apply equally to tuberculosis, as a comparison of Tables 10 and 21 will show.

During the fifteen years in which the occupation of tuberculous persons has been studied, very many cases were reported as having no occupations, as infants, inmates of charitable, penal and reformatory institutions, etc.

To learn what occupations render persons more susceptible to tuberculosis than others, this Department has made a special study of certain occupations, showing the proportionate mortality from tuberculosis in the two years, 1908-1909, compared with the average mortality from tuberculosis of all persons in Michigan, in the five years, 1903-1907, by age groups, as may be seen by Tables 21A, 21B, etc.

By reference to Table 21A, it is shown that the average annual per cent of deaths due to tuberculosis, among all persons, in the five years, 1903-1907, is 9.4; by reference to Table 21C, it will be seen that the average annual per cent of deaths due to tuberculosis among males, for the same five year period, is 8.4; and Table 21F shows that the average annual per cent of deaths due to tuberculosis among females, for the same five year period, is 10.6.

Table 21A shows that in the two years, 1908-1909, tuberculosis was responsible for 31.8 per cent of all deaths among persons following the occupation of cigarmaker, which, as compared with the average, or normal, death rate from tuberculosis, among all persons (9.4), is 238 per cent higher.

Table 21B shows that, in the two years, 1908-1909, tuberculosis was responsible for 29.6 per cent of all deaths among persons following the occupation of school teacher, which was 215 per cent higher than the normal rate for all persons.

Table 21C indicates that, in 1908-1909, tuberculosis was responsible for 23.2 per cent of all deaths among printers (males), which, compared with the normal death rate among males (8.4), is 176 per cent higher than the normal.

Table 21D shows that tuberculosis was responsible for 18.3 per cent of all deaths among painters (males), which, compared with the average death rate among males (8.4), is 118 per cent higher than normal.

By Table 21E it will be seen that, in the two years, 1908-1909, tuberculosis was responsible for 14.6 per cent of all deaths among teamsters (males), which, compared with the average death rate of all males (8.4), is 74 per cent higher than normal.

Table 21F indicates that, in the two years, 1908-1909, tuberculosis was responsible for 16.7 per cent of all deaths among dressmakers (females), which, compared with the average death rate from tuberculosis among females (10.6), is 58 per cent higher than normal.

Table 21G indicates that, in the two years, 1908-1909, tuberculosis was responsible for 13.4 per cent of all deaths among miners (males), which, compared with the average death rate of all males (8.4), is 60 per cent higher than normal.

Table 21H shows that, in the two years, 1908-1909, tuberculosis was responsible for 10.2 per cent of all deaths among tailors, which, compared with the average death rate of all persons (9.4), is 9 per cent higher than normal.

Table 21I shows that, in the two years, 1908-1909, tuberculosis was responsible for only 7.6 per cent of all deaths among carpenters (males), which, compared with the average death rate for males (8.4), is 10 per cent less than normal. This low rate is doubtless due to the fact that they are usually employed where they get an abundance of fresh air.

By Table 21J it will be seen that, with the exception of miners, the average duration of life by certain occupations is materially shortened by tuberculosis. Those persons whose time is employed in dressmaking seem to be the greatest losers in this respect of any of those following the occupations named in the table, their expected duration of life being shortened 35 per cent.

TABLE 21.—*Occupation of 22,273 tuberculous persons, in Michigan, in the fifteen years, 1895-1909.*

Occupations.	Number of instances.	Occupations.	Number of instances.	Occupations.	Number of instances.
Housework.....	9,121	Photographer.....	25	Stockbuyer.....	3
Farmer.....	3,036	Stone or marble cutter....	24	Upholsterer.....	2
Laborer.....	2,602	Fisherman.....	23	Silk worker.....	2
Student.....	1,190	Miller.....	19	Chauffer.....	2
Clerk (office or store).....	1,079	Janitor.....	17	Stereotyper.....	2
Mechanic.....	688	Butcher.....	16	Chiropodist.....	2
Merchant.....	532	Lumberman.....	14	Diver.....	2
Teacher.....	286	Porter.....	14	Bootblack.....	2
Dressmaker and Milliner....	275	Metal polisher.....	13	Scientist.....	2
Miner.....	262	Dentist.....	11	Broommaker.....	2
Machinist.....	256	Contractor and builder....	11	Chemist.....	2
Teamster.....	255	Mason.....	10	Weaver.....	2
Factory employee.....	254	Theatrical person.....	10	Oculist.....	2
Painter and paperhanger....	201	Blacksmith.....	10	Billposter.....	2
Saloonman.....	157	Civil engineer.....	9	Furniture packer.....	2
Salesman or agent.....	153	Hunter and trapper.....	8	Cheesemaker.....	2
Railroad employee.....	144	Motorman.....	8	Baseball player.....	2
Cigarmaker.....	113	Undertaker.....	7	Millwright.....	1
Barber.....	113	Patrolman.....	7	Elevator man.....	1
Printer.....	109	Tanner.....	7	Steward.....	1
Engineer.....	89	Jeweler.....	7	Plasterer.....	1
Cook.....	79	Harnessmaker.....	6	Bookbinder.....	1
Sailor.....	74	Mail carrier.....	5	Balloonist.....	1
Woodsmen.....	72	Boorman.....	5	Attendant in prison or asy-	
Tailor.....	68	Veterinary surgeon.....	5	lum.....	1
Musician.....	57	Glassworker.....	5	Dancing master.....	1
Artist.....	56	Liveryman.....	5	Prostitute.....	1
Moulder.....	55	Hairdresser.....	4	Feather renovator.....	1
Shoemaker.....	51	Athlete.....	4	Chimney sweep.....	1
Physician or surgeon.....	51	Peddler.....	4	Papermaker.....	1
Nurse.....	50	Telephone operator.....	4	Milkman.....	1
Baker.....	47	Candymaker.....	4	Sewer inspector.....	1
Gardner or florist.....	42	Ice man.....	4	Engraver.....	1
Waiter.....	41	Tinner.....	4	Messenger.....	1
Laundry work.....	39	Brassworker.....	3	Sawfiler.....	1
Minister.....	34	Carriage trimmer.....	3	Jockey.....	1
Lawyer.....	31	Buttermaker.....	3	Shears grinder.....	1
Soldier.....	29	Rag picker and sorter....	3	Newsboy.....	1
Fireman.....	29	Watchman.....	3	Beanpicker.....	1
Plumber.....	27	Coremaker.....	3		
Electrician.....	25	Cooper.....	3		

TABLE 21A.—*The proportionate mortality from tuberculosis among cigarmakers in 1908 and 1909, compared with that of all persons in Michigan, from 1903-1907, by age groups.*

Age at death.	Deaths of cigarmakers in 1908-1909, due to—		Per cent of all deaths due to tuberculosis among—	
	All causes.	Tuberculosis.	Cigarmakers, 1908-1909.	All persons in Michigan, 1903-1907.
15 to 24 years.....	21	10	47.6	27.1
25 to 34 years.....	16	10	62.5	25.8
35 to 44 years.....	11	5	45.5	16.6
45 to 54 years.....	15	2	13.3	9.4
55 to 64 years.....	11	.....	.....	5.1
65 years and over.....	11	.....	.....	1.5
All ages.....	85	27	31.8	9.4

TABLE 21B.—*The proportionate mortality from tuberculosis among school teachers in 1908 and 1909, compared with that of all persons in Michigan, from 1903-1907, by age groups.*

Age at death.	Deaths of school teachers in 1908-1909, due to—		Per cent of all deaths due to tuberculosis among—	
	All causes.	Tuberculosis.	School teachers, 1908-1909.	All persons in Michigan, 1903-1907.
15 to 24 years.....	54	19	35.2	27.1
25 to 34 years.....	41	28	68.3	25.8
35 to 44 years.....	29	8	27.6	16.6
45 to 54 years.....	17	2	11.8	9.4
55 to 64 years.....	21	2	9.5	5.1
65 years and over.....	44	2	4.5	1.5
All ages.....	206	61	29.6	9.4

TABLE 21C.—*The proportionate mortality from tuberculosis among printers in 1908 and 1909, compared with that of all males in Michigan, from 1903-1907, by age groups.*

Age at death.	Deaths of printers in 1908-1909, due to—		Per cent of all deaths due to tuberculosis among—	
	All causes.	Tuberculosis.	Printers, 1908-1909.	All males in Michigan, 1903-1907.
15 to 24 years.....	22	7	31.8	21.9
25 to 34 years.....	14	5	35.7	23.8
35 to 44 years.....	7	2	28.6	16.1
45 to 54 years.....	11	2	18.2	9.7
55 to 64 years.....	5	.....	.....	5.0
65 years and over.....	10	.....	.....	1.5
All ages.....	69	16	23.2	8.4

TABLE 21D.—*The proportionate mortality from tuberculosis among painters in 1908 and 1909, compared with that of all males in Michigan, from 1903-1907, by age groups.*

Age at death.	Deaths of painters in 1908-1909, due to—		Per cent of all deaths due to tuberculosis among—	
	All causes.	Tuberculosis.	Painters, 1908-1909.	All males in Michigan, 1903-1907.
15 to 24 years.....	16	5	31.3	21.9
25 to 34 years.....	40	18	45.0	23.8
35 to 44 years.....	41	12	29.3	16.1
45 to 54 years.....	40	4	10.0	9.7
55 to 64 years.....	53	4	7.5	5.0
65 years and over.....	67	4	6.0	1.5
All ages.....	257	47	18.3	8.4

TABLE 21E.—*The proportionate mortality from tuberculosis among teamsters in 1908 and 1909, compared with that of all males in Michigan, from 1903-1907, by age groups.*

Age at death.	Deaths of teamsters in 1908-1909, due to—		Per cent of all deaths due to tuberculosis among—	
	All causes.	Tuberculosis.	Teamsters, 1908-1909.	All males in Michigan, 1903-1907.
15 to 24 years.....	32	9	28.1	21.9
25 to 34 years.....	34	8	23.5	23.8
35 to 44 years.....	33	6	18.2	16.1
45 to 54 years.....	43	5	11.6	9.7
55 to 64 years.....	34	3	8.8	5.0
65 years and over.....	43	1	2.3	1.5
All ages.....	219	32	14.6	8.4

TABLE 21F.—*The proportionate mortality from tuberculosis among dressmakers in 1908 and 1909, compared with that of all females in Michigan, from 1903-1907, by age groups.*

Age at death.	Deaths of dressmakers in 1908-1909, due to—		Per cent of all deaths due to tuberculosis among—	
	All causes.	Tuberculosis.	Dress-makers, 1908-1909.	All females in Michigan, 1903-1907.
15 to 24 years.....	35	10	28.6	32.6
25 to 34 years.....	17	9	52.9	27.7
35 to 44 years.....	30	4	13.3	17.1
45 to 54 years.....	23	.....	.....	9.0
55 to 64 years.....	17	1	5.9	5.3
65 years and over.....	22	.....	.....	1.1
All ages.....	144	24	16.7	10.6

TABLE 21G.—*The proportionate mortality from tuberculosis among miners in 1908 and 1909, compared with that of all males in Michigan, from 1903-1907, by age groups.*

Age at death.	Deaths of miners in 1908-1909, due to—		Per cent of all deaths due to tuberculosis among—	
	All causes.	Tuberculosis.	Miners, 1908-1909.	All males in Michigan, 1903-1907.
15 to 24 years.....	127	13	10.2	21.9
25 to 34 years.....	143	17	11.9	23.8
35 to 44 years.....	104	15	14.4	16.1
45 to 54 years.....	70	13	18.6	9.7
55 to 64 years.....	48	6	12.5	5.0
65 years and over.....	38	7	18.4	1.5
All ages.....	530	71	13.4	8.4

TABLE 21H.—*The proportionate mortality from tuberculosis among tailors in 1908 and 1909, compared with that of all persons in Michigan, from 1903-1907, by age groups.*

Age at death.	Deaths of tailors in 1908-1909, due to—		Per cent of all deaths due to tuberculosis among—	
	All causes.	Tuberculosis.	Tailors, 1908-1909.	All persons in Michigan, 1903-1907.
15 to 24 years.....	6	1	16.7	27.1
25 to 34 years.....	13	5	38.5	25.8
35 to 44 years.....	13	4	37.7	16.6
45 to 54 years.....	35	5	14.3	9.4
55 to 64 years.....	35	2	5.7	5.1
65 years and over.....	64	.....	.....	1.5
All ages.....	166	17	10.2	9.4

TABLE 21I.—*The proportionate mortality from tuberculosis among carpenters in 1908 and 1909, compared with that of all males in Michigan, from 1903-1907, by age groups.*

Age at death.	Deaths of carpenters in 1908-1909, due to—		Per cent of all deaths due to tuberculosis among—	
	All causes.	Tuberculosis.	Carpenters, 1908-1909.	All males in Michigan, 1903-1907.
15 to 24 years.....	15	5	33.3	21.9
25 to 34 years.....	42	11	26.2	23.8
35 to 44 years.....	66	17	25.8	16.1
45 to 54 years.....	112	15	13.4	9.7
55 to 64 years.....	191	13	6.8	5.0
65 years and over.....	454	6	1.3	1.5
All ages.....	880	67	7.6	8.4

TABLE 21J.—*The average duration of life of persons engaged in certain occupations as influenced by tuberculosis.*

Occupations.	Average age at death from all causes, 1908-1909.	Average age at death from tuberculosis, 1908-1909.	Shortened duration of life due to tuberculosis—expressed in per cents.
Carpenters.....	61	45	26.2
Tailors.....	57	41	28.1
Painters.....	51	39	23.5
School teachers.....	43	31	27.9
Dressmakers.....	43	28	34.9
Cigarmakers.....	41	29	29.3
Printers.....	39	28	28.2
Miners.....	37	40	*

*This exception is probably due to the fact that a large number engaged in the occupation of a miner lose their life at an early age through violence, thereby reducing the average age at death, from all causes, very materially.

DURATION OF SICKNESS IN TUBERCULOSIS.

As stated previously in this report, the time of the inception of the disease is very seldom known, therefore it is impossible to accurately obtain the information as to the duration of tuberculosis. Owing to this fact this phase of the study was discontinued in 1909, but for the benefit of those who wish to get this information, as gathered in the past years, Table 22 is republished.

TABLE 22.—*The reported duration of sickness in 18,111 fatal and non-fatal cases of tuberculosis, in Michigan, during the fifteen years, 1894-1908.*

Duration periods.	Fatal cases.						Non-fatal cases.		
	Number.			Per cent.			Number.		
	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.
1 month.....	568	483	1,051	3.16	2.69	5.85	6	4	10
2 months.....	413	488	901	2.30	2.72	5.02	10	5	15
3 months.....	493	607	1,100	2.75	3.38	6.13	7	10	17
4 months.....	428	548	976	2.33	3.05	5.43	7	2	9
5 months.....	358	482	840	1.99	2.68	4.67	6	5	11
6 months.....	649	751	1,400	3.62	4.18	7.80	4	4	8
7 months.....	288	438	726	1.60	2.44	4.04	3	4	7
8 months.....	331	426	757	1.85	2.37	4.22	4	5	9
9 months.....	230	416	646	1.28	2.32	3.60	1	5	6
10 months.....	204	280	484	1.14	1.56	2.70	1	1	2
11 months.....	175	257	432	.97	1.43	2.40	3	1	4
Under 1 year.....	4,137	5,176	9,313	23.04	28.82	51.86	52	46	98
1 to 2 years.....	1,860	2,301	4,161	10.36	12.81	23.17	12	19	31
2 to 3 years.....	999	1,170	2,169	5.56	6.52	12.08	4	5	9
3 to 4 years.....	441	483	924	2.46	2.69	5.15	2	3	5
4 to 5 years.....	188	208	396	1.04	1.16	2.20	2	3	5
5 years and over.....	464	532	996	2.58	2.96	5.54	.....	4	4
Totals.....	8,089	9,870	17,959	45.04	54.96	100.00	72	80	152

RESTRICTIVE AND PREVENTIVE MEASURES.

The disinfection of the sputa, upon which the restriction of tuberculosis depends, was properly carried out in but forty-five per cent of all the cases which occurred in the years, 1904-1909; that is to say, in the majority (fifty-five per cent) of these cases the tuberculous sick neglected the most important measure for preventing the spread of this disease. Now while during the eleven years, 1898-1909, the death rate from tuberculosis has decreased materially, a reduction undoubtedly due to the observance of the restrictive measures recommended by this Department, yet the above-mentioned fact that fifty-five per cent of the tuberculous are still neglecting the destruction of the sputa can only testify that the observance of the preventive measures is by no means as general as it should be, and that the reduction of the disease is by no means commensurate with the positive knowledge we have regarding the mode of its prevention. This may be explained partly by the failure of a large number of persons to obtain an early diagnosis, and who, therefore,

through promiscuous spitting, etc., are sources of spreading tuberculosis. Furthermore, the failure of this fifty-five per cent to destroy the sputa may be due to lack of cooperation between the physicians and the health officials, whereby the tuberculous remain uninstructed regarding the necessary precautions and unsupervised regarding their observance.

That the local board of health and the practicing physicians in every locality have a responsibility in the task of suppressing tuberculosis, is evident. Again, in this fifty-five per cent, there are undoubtedly those cases where both physician and health officer urge the destruction of the sputa, yet where the patient, through carelessness, prejudice or poverty, neglects to observe that measure; and for such cases the only effectual control will be institutional care in a hospital erected and conducted for the care of the tuberculous sick.

TABLE 23.—*Restrictive and preventive measures in tuberculosis, in Michigan, in the six years, 1904-1909.*

Restrictive and preventive measures.	Number of cases.	Per cent.
DISINFECTION OF SPUTA:		
Enforced.....	7,140	*45
Neglected.....	871	*5
Not stated, or statements doubtful.....	8,249	*51
DISINFECTION OF SOILED BEDDING, CLOTHING, ETC.:		
Enforced.....	9,663	57
Neglected.....	722	4
Not stated, or statements doubtful.....	6,613	39
DISINFECTION OF DISCHARGES FROM BOWELS AND BLADDER:		
Enforced.....	532	†47
Neglected.....	288	†25
Not stated, or statements doubtful.....	327	†28
DISINFECTION OF ROOMS OCCUPIED BY PATIENTS:		
Enforced.....	9,136	54
Neglected.....	1,376	8
Not stated, or statements doubtful.....	6,486	38

*Disinfection of the sputa was not considered necessary in 738 instances, in which there was said to be no sputa, or in which the disease was said to be located only in the bowels, stomach, liver, etc., therefore this number has been deducted from the 16,998 cases, reported during the six years, before making the per cent.

†Disinfection of the bowel discharges was considered necessary in but 1,147 instances, i. e., where the disease was located solely, or in combination with some other organ, in the bowels, or in some other part of the body from which infection might leave the body by way of the bowels or bladder.

BACTERIOLOGICAL DIAGNOSIS IN TUBERCULOSIS.

During the fifteen years, 1895-1909, reports relative to the bacteriological examination of 3,659 samples of sputa of suspected cases of tuberculosis indicate that 95 per cent gave positive and 5 per cent negative results.

MENINGITIS IN MICHIGAN IN 1909 AND PRECEDING YEARS.

GENERAL PREVALENCE.

During the year 1909, meningitis was reported to the Secretary of the State Board of Health from 270 localities, in which there were reported to have occurred 577 cases, including 575 deaths from this disease.

From the number of cases and deaths, shown in Table 24, it will be seen that, as a rule, only the fatal cases were reported.

Prior to 1904, the disease was considered under the various names reported, viz.: Cerebro-spinal meningitis, cerebral meningitis, meningitis, spinal meningitis, tubercular meningitis and traumatic meningitis. In the articles subsequent to 1903, all the various forms of the disease have been considered under the general title of meningitis.

For the purpose of learning what relation the number of cases and deaths from tubercular and traumatic meningitis bear to the total meningitis, these two forms of the disease have been considered separately in Table 26.

In the tables, wherever possible, totals, averages and per cents for a series of years, rather than for the single year 1909, have been shown.

By Table 24, it will be seen that, in 1899, when the statistical study of meningitis was first commenced by this Department, the disease was unusually prevalent, therefore the average of series of years beginning with 1899 is higher than it would be for similar periods under normal conditions.

TABLE 24.—*The prevalence of meningitis, in Michigan, in each of the eleven years, 1899-1909.*

Years.	Population.*	Number of cases.†	Number of deaths.	Deaths per 100,000 population.
1899.....	2,426,331	1,306	1,079	44.5
1900.....	2,420,982	747	688	28.4
1901.....	2,448,241	614	594	24.3
1902.....	2,475,499	632	598	24.2
1903.....	2,502,758	645	630	25.2
1904.....	2,530,016	598	586	23.2
1905.....	2,557,275	675	646	25.3
1906.....	2,584,533	650	627	24.3
1907.....	2,611,792	680	670	25.7
1908.....	2,639,050	622	612	23.2
1909.....	2,666,309	577	575	21.6
Annual averages.....	2,532,071	704	664	26.2

*Estimated for intercensal years.

†From many localities only the fatal cases were reported, so that the figures in this column do not accurately represent the number of cases which occurred.

Table 24 shows a much greater average death rate from meningitis in the years in which efforts have been made for its restriction and prevention than

the average death rate for a long series of years prior to that time, shown in Table 25. This is probably due to the fact that, prior to 1898, under the old law for the registration of deaths, not all deaths were reported, and to the fact that the rates in Table 25 do not include tubercular meningitis, which, in recent years, has caused about 15 per cent of all the deaths from meningitis.

TABLE 25.—*The number of reported deaths from meningitis,* in Michigan, per 100,000 persons living, in each of the thirty years, 1869-1898. Compiled from the Secretary of State's Vital Statistics of Michigan.*

Years	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
Deaths.....	1.2	.9	2.0	28.6	62.6	13.9	12.0	8.6	9.3	7.2	6.6	9.7
Years	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Deaths.....	19.6	13.0	12.7	12.8	9.2	9.4	9.3	9.6	8.0	8.6	9.6	6.8
Years	1893.	1894.	1895.	1896.	1897.	1898.†	Average, 1869-1898.					
Deaths.....	7.8	8.1	7.8	8.3	9.7	28.4	12.0					

*Does not include tubercular meningitis.

†Not all the deaths were reported under the old law, therefore a comparison of death rates for any year subsequent to 1897 with the death rates for any period prior to 1898 would not be reliable. The rates for the twenty-nine years, ending with 1897, probably quite accurately represent the annual fluctuations of the disease.

TABLE 26.—*The reported number of cases and deaths from tubercular and traumatic meningitis, in Michigan, in the eleven years, 1899-1909.*

Years.	Tubercular.				Traumatic.			
	Number of cases.	Number of deaths.	Per cent of all forms of meningitis.		Number of cases.	Number of deaths.	Per cent of all forms of meningitis.	
			Cases.	Deaths.			Cases.	Deaths.
1899.....	42	41	3	4	22	22	2	2
1900.....	93	83	12	12	17	17	2	2
1901.....	86	86	14	14	22	22	4	4
1902.....	96	94	15	16	8	8	1	1
1903.....	106	106	16	17	14	14	2	2
1904.....	126	133	21	23	24	24	4	4
1905.....	95	107	14	16	3	4	4	6
1906.....	108	106	17	17	9	8	1	1
1907.....	88	86	13	13	17	17	3	3
1908.....	128	124	21	20	7	7	1	1
1909.....	103	103	18	18	17	17	3	3

TABLE 27.—*The geographical distribution of meningitis, in Michigan, in the eleven years, 1899-1909, as indicated by the average number of cases and deaths, and the average deaths per 100,000 persons living, in each geographical division shown in the table.*

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
UPPER PENINSULAR DIVISION.....	274,008	108.8	100.8	36.8
Alger county.....	6,507	2	2	30.7
Baraga county.....	5,250	2	2	38.1
Chippewa county.....	21,971	5	5	22.8
Delta county.....	27,133	7	7	25.8
Dickinson county.....	18,755	5	5	26.7
Gogebic county.....	17,173	5	5	29.1
Houghton county.....	69,738	48	43	61.7
Iron county.....	8,867	1	1	11.3
Keweenaw county.....	4,513	2	1	22.2
Luce county.....	3,833	.8	.8	20.9
Mackinac county.....	8,150	2	2	24.5
Marquette county.....	39,908	17	16	40.1
Menominee county.....	26,288	8	8	30.4
Ontonagon county.....	7,198	2	1	13.9
Schoolcraft county.....	8,724	2	2	22.9
NORTHWESTERN DIVISION.....	91,904	32	27	29.4
Benzie county.....	10,989	4	4	36.4
Grand Traverse county.....	23,467	6	5	21.3
Leelanau county.....	10,904	2	2	18.3
Manistee county.....	27,213	11	8	29.4
Wexford county.....	19,331	9	8	41.4
NORTHERN DIVISION.....	85,299	27.3	25.2	29.6
Antrim county.....	15,487	8	7	45.2
Charlevoix county.....	16,220	3	3	18.5
Cheboygan county.....	17,366	7	6	34.6
Crawford county.....	3,820	.3	.2	5.2
Emmet county.....	17,671	5	5	28.3
Kalkaska county.....	7,538	2	2	26.5
Otsego county.....	7,197	2	2	27.8
NORTHEASTERN DIVISION.....	61,278	9.49	9.39	15.3
Alcona county.....	5,660	.7	.7	12.4
Alpena county.....	19,976	4	4	20.0
Iosco county.....	10,410	2	2	19.2
Montmorency county.....	3,557	.8	.8	22.4
Ogemaw county.....	8,965	.9	.8	8.9
Oscoda county.....	1,917	.09	.09	4.7
Presque Isle county.....	10,793	1	1	9.3
WESTERN DIVISION.....	280,161	78.8	73.7	26.3
Kent county.....	139,346	49	44	31.6
Lake county.....	5,017	.8	.7	14.0
Mason county.....	19,814	4	4	20.2
Muskegon county.....	37,101	9	9	24.3
Newaygo county.....	18,416	3	3	16.3
Oceana county.....	17,840	4	4	22.4
Ottawa county.....	42,627	9	9	21.1
NORTHERN CENTRAL DIVISION.....	107,960	27.4	25.0	23.2
Clare county.....	9,221	2	2	21.7
Gladwin county.....	8,575	1	.8	9.3
Isabella county.....	24,316	7	6	24.7
Mecosta county.....	20,326	7	6	29.5
Midland county.....	14,821	4	4	27.0
Missaukee county.....	10,291	2	2	19.4
Osceola county.....	18,735	4	4	21.4
Roscommon county.....	1,675	.4	.2	11.9

*†These footnotes are below Table 24, on a preceding page.

TABLE 27.—CONCLUDED.

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
BAY AND EASTERN DIVISION.....	348,520	75	72	20.7
Arenac county.....	10,074	1	1	9.9
Bay county.....	63,931	15	15	23.5
Huron county.....	35,211	7	7	19.9
Lapeer county.....	27,111	4	3	11.1
Saginaw county.....	85,781	20	19	22.1
Sanilac county.....	34,916	6	6	17.2
St. Clair county.....	55,451	13	12	21.6
Tuscola county.....	36,045	9	9	25.0
CENTRAL DIVISION.....	316,348	69	63	19.9
Barry county.....	22,112	6	5	22.6
Clinton county.....	25,284	5	4	15.8
Eaton county.....	30,830	6	6	19.5
Genesee county.....	42,789	9	9	21.0
Graiot county.....	30,462	9	8	26.3
Ingham county.....	43,911	9	8	18.2
Ionia county.....	34,908	8	7	20.1
Livingston county.....	18,648	3	3	16.1
Montcalm county.....	33,572	8	7	20.9
Shiawassee county.....	33,832	6	6	17.7
SOUTHWESTERN DIVISION.....	143,505	26	24	16.7
Allegan county.....	39,011	9	8	20.5
Berrien county.....	49,569	8	7	14.1
Cass county.....	20,064	3	3	15.0
Van Buren county.....	34,861	6	6	17.2
SOUTHERN CENTRAL DIVISION.....	325,366	68	64	19.4
Branch county.....	26,153	5	4	15.3
Calhoun county.....	53,330	10	10	18.8
Hillsdale county.....	29,829	5	5	16.8
Jackson county.....	47,115	11	11	23.3
Kalamazoo county.....	49,997	12	11	22.0
Lenawee county.....	49,136	8	8	16.3
St. Joseph county.....	23,292	6	5	21.5
Washtenaw county.....	46,514	11	10	21.5
SOUTHEASTERN DIVISION.....	498,464	177	176	35.3
Macomb county.....	33,079	7	7	21.2
Monroe county.....	33,060	8	8	24.2
Oakland county.....	45,738	7	7	15.3
Wayne county.....	386,587	155	154	39.8

*†These footnotes are below Table 24, on a preceding page.

GEOGRAPHICAL DISTRIBUTION OF MENINGITIS.

By Table 27 it may be seen that, as indicated by the average death rate for the entire State (26.2 per 100,000 inhabitants), during the eleven years ending with 1909, meningitis was much more prevalent than the average in the Upper Peninsular and Southeastern Divisions. By the same standard, the disease was much more prevalent than the average in the counties of Baraga, Houghton, Marquette, Benzie, Wexford, Antrim, Cheboygan and Wayne.

THE PREVALENCE OF MENINGITIS IN URBAN AND RURAL LOCALITIES.

Table 28 shows meningitis to have been present, in 1909, in 23 per cent of the incorporated cities and villages, whose populations could be estimated for that year. There were 57 cities and villages whose populations could

not be estimated for the year 1909, therefore these localities have been included with the rural localities shown in the last line of Table 28.

As in the case of pneumonia and tuberculosis, previously considered, meningitis was most prevalent in the large centers of population.

By Table 28A, it may be seen that, in 1909, the urban localities which showed much higher death rates from meningitis than the death rate for this disease for the entire State (21.6), for that year, were: Albion, Ann Arbor, Battle Creek, Benton Harbor, Cadillac, Detroit, Flint, Hancock, Iron Mountain, Ishpeming, Jackson, Kalamazoo, Lansing, Laurium, Ludington, Negaunee, Niles, Pontiac, Saginaw, Sault Ste. Marie and Wyandotte.

The localities, shown in Table 28A, in which the death rate was much lower in 1909 than the rate for the entire State for that year were: Adrian, Bay City, Escanaba, Holland, Monroe, Port Huron and Ypsilanti.

The localities, shown in Table 28A, which showed much higher death rates from meningitis in 1909 than the average for such localities in the years 1904-1908, were: Ann Arbor, Battle Creek, Benton Harbor, Cadillac, Flint, Hillsdale, Jackson, Lansing, Laurium, Ludington, Marquette, Niles, Pontiac and Saginaw.

The localities, shown in Table 28A, which showed much lower death rates from meningitis in 1909 than the average for such localities in the years, 1904-1908, were: Adrian, Bay City, Calumet township, Escanaba, Hancock, Holland, Ironwood, Ishpeming, Manistee, Monroe, Muskegon, Petoskey and Port Huron.

TABLE 28.—*The prevalence of meningitis in urban and rural localities, in Michigan, in 1909.*

Localities—Grouped according to density of population.	Population.*	Health jurisdictions.			Cases.†	Deaths.	Death rates per 100,000 of the population.
		Total.	Infected.				
			Number.	Per cent of all jurisdictions.			
Cities over 50,000.....	524,498	3	3	100	190	192	36.6
Cities from 25,000 to 50,000.....	154,255	5	5	100	38	39	25.3
Cities from 10,000 to 25,000 and Calumet township (18,628).....	222,289	16	16	100	56	55	24.7
Cities and villages from 5,000 to 10,000.....	185,982	28	18	64	38	39	21.0
Cities and villages under 5,000‡.....	352,905	325	43	13	51	48	13.6
Total urban.....	1,439,929	377	85	23	373	373	26.0
Balance of localities—principally townships§....	1,226,380	1,284	185	14	204	202	16.5

*†These footnotes are below Table 24, on a preceding page.

‡Exclusive of 57 cities and villages, for which the population for 1909 cannot be correctly estimated.

§Includes the 57 cities and villages mentioned in the preceding paragraph, but does not include Calumet township, which, for the purpose of this study, is included in the third group of urban localities, which have corresponding populations.

TABLE 28A.—*The deaths from meningitis in 1909, and in preceding years, in each of the principal localities included in the first four groups in Table 28.*

Localities.	1909.			Average, 1904-1908.		
	Population.*	Deaths.	Deaths per 100,000 inhabitants.	Population.*	Deaths.	Deaths per 100,000 inhabitants.
Adrian.....	11,963	1	8.4	11,193	3	26.8
Albion.....	5,473	2	36.5	5,155	2	38.8
Alpena.....	13,148	3	22.8	12,699	3	23.6
Ann Arbor.....	14,712	8	54.4	14,643	4	27.3
Battle Creek.....	26,776	8	29.9	24,038	4	16.6
Bay City.....	40,509	4	9.9	37,989	† 8	21.1
Benton Harbor.....	6,877	2	29.1	6,772	1	14.8
Big Rapids.....	5,060	0	.....	4,935	2	40.5
Cadillac.....	8,013	3	37.4	7,341	2	27.2
Calumet township.....	18,628	5	26.8	17,813	13	73.0
Charlotte.....	5,519	0	.....	5,043	2	39.7
Cheboygan.....	7,032	0	.....	6,851	3	43.8
Coldwater.....	6,237	0	.....	6,230	2	32.1
Detroit.....	306,646	145	39.5	338,435	161	47.6
Escanaba.....	13,035	2	15.3	11,873	5	42.1
Flint.....	17,111	7	40.9	15,775	4	25.4
Grand Haven.....	5,859	0	.....	5,487	.6	10.9
Grand Rapids.....	105,910	26	24.5	99,795	30	30.1
Hancock.....	8,521	3	35.2	7,030	4	56.9
Hillsdale.....	5,632	1	17.8	5,138	.2	3.9
Holland.....	10,436	1	9.6	9,554	2	20.9
Houghton.....	5,581	1	17.9	4,839	.8	16.5
Ionia.....	5,239	1	19.1	5,229	1	19.1
Iron Mountain.....	7,764	3	38.6	8,256	3	36.3
Ironwood.....	10,412	2	19.2	10,176	3	29.5
Ishpeming.....	9,583	4	41.7	10,807	8	74.0
Jackson.....	25,450	10	39.3	25,360	6	23.7
Kalamazoo.....	36,505	10	27.4	32,471	9	27.7
Lansing.....	25,015	7	28.0	22,172	3	13.5
Laurium.....	10,166	4	39.3	8,658	1	11.6
Ludington.....	7,376	5	67.8	7,306	2	27.4
Manistee.....	10,768	2	18.6	11,932	3	25.1
Manistique.....	5,184	0	.....	4,831	2	41.4
Marquette.....	11,424	3	26.3	10,969	2	18.2
Menominee.....	8,944	0	.....	10,235	5	48.9
Monroe.....	7,485	1	13.4	6,671	2	30.0
Mt. Clemens.....	7,773	0	.....	7,374	1	13.6
Mt. Pleasant.....	5,512	1	18.1	4,895	1	20.4
Muskegon.....	20,995	4	19.1	20,937	6	28.7
Negaunee.....	6,625	4	60.4	6,728	4	59.5
Niles.....	5,084	2	39.3	4,819	1	20.8
Norway.....	5,732	0	.....	5,211	.4	7.7
Owosso.....	9,707	0	.....	9,370	2	21.4
Petoskey.....	5,092	1	19.8	5,136	2	38.9
Pontiac.....	12,278	5	40.7	11,442	1	8.7
Port Huron.....	21,116	1	4.7	20,463	4	19.5
Saginaw.....	51,942	21	40.4	48,743	12	24.6
St. Joseph.....	5,531	1	18.1	5,406	1	18.5
Sault Ste. Marie.....	12,572	4	31.8	11,894	4	33.6
Traverse City.....	13,525	3	22.2	12,152	3	24.7
Wyandotte.....	5,728	3	52.4	5,546	3	54.1
Ypsilanti.....	7,849	1	12.7	7,692	1	13.0

*Estimated for intercensal years.

†Does not include West Bay City for 1904, which was consolidated with Bay City in 1905.

THE SEASONAL PREVALENCE OF MENINGITIS.

Table 29 is compiled from two different sources, and shows that meningitis is most prevalent in the months of March, April and May and least prevalent in the months of October, November and December.

TABLE 29.—*The seasonal prevalence of meningitis, in Michigan, in so far as indicated by the average number of persons taken sick and who died from this disease in each month in the eleven years, 1899-1909.*

Months.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Average number of those taken sick	42	43	66	63	52	38	40	40	39	33	29	28
Average number of deaths.....	42	50	64	68	60	47	47	46	43	38	34	34

REPORTED SOURCES OF CONTAGIUM AND PREDISPOSING INFLUENCES IN MENINGITIS.

For the reason that, since 1906, the number of instances in which the sources of contagium and predisposing influences in meningitis reported were very small, as compared with the total number of cases of meningitis, health officers were requested to supply information only relative to those cases which were traced to former cases of the disease, or which followed the four diseases, shown in Table 30 of this article, which are intimately associated with meningitis.

The information, collected in previous years, relative to the previous and contemporaneous cases of meningitis, tuberculosis, influenza and pneumonia occurring in the same families in which the meningitis patients resided, having been too meagre for consideration, Table 31 was discontinued in 1909, but is reprinted in this report for the benefit of those who wish to study the same in connection with Table 30.

TABLE 30.—*The reported source of contagium and predisposing influences in meningitis, in Michigan, in the eleven years, 1899-1909.*

Source and predisposing influences.	Number of instances.
Traced to a former case.....	83
Following an attack, in the same person, of:	
Influenza.....	137
Pneumonia.....	105
Tuberculosis.....	79
Bronchitis.....	35

TABLE 31.—*Meningitis, in Michigan, in the five years, 1904-1908, and previous and contemporaneous cases of meningitis, tuberculosis, influenza and pneumonia, which occurred in the same families in which the meningitis patients resided.*

Disease.	The time which lapsed between cases of meningitis in 1904-1908 and previous and contemporaneous cases of the diseases named below, with the number of instances in each period of time.												
	On or about same time.	1 day.	3 days.	4 days.	9 days.	10 days.	14 days.	18 days.	1 month.	2 months.	3 months.	4 months.	5 months.
Meningitis.....	18	2	1	.....	.....	2	2	.....	.....	1	.....	1	.....
Tuberculosis.....	27	.....	.....	1	1	.....	2	1	2	3	3	1	.....
Influenza.....	4	.....	1	1	.....	.....	.....	.....	1	.....	.....	.....	.....
Pneumonia.....	2	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	1

	6 months.	8 months.	1 year and over.	No time stated.
Meningitis.....	1	.....	1	6
Tuberculosis.....	2	1	8	23
Influenza.....	.....	.....	.....	5
Pneumonia.....	1	.....	.....	4

THE INFLUENCE OF AGE AND SEX IN MENINGITIS.

Table 32 confirms what has been stated in preceding reports relative to meningitis, that it is essentially a disease of childhood, nearly 57 per cent of all the fatal cases in which the age was stated, during the eleven years ending in 1909, having occurred in children under five years of age. There was a gradual decrease in the number of deaths corresponding with each increase in age, up to the fiftieth year.

With but two exceptions, ages 5 to 9 and 10 to 14 years, meningitis was more fatal among the male population at all ages shown in the table.

THE DURATION OF SICKNESS IN MENINGITIS.

Table 33 shows that of the 4,145 fatal cases of meningitis, in which the duration of sickness was reported, in the nine years, 1901-1909, nearly 39 per cent of the deaths occurred between the first and fifth days; nearly 63 per cent between the first and tenth days, and nearly 78 per cent between the first and fifteenth days.

TABLE 32.—*The influence of age and sex in meningitis, in Michigan, as indicated by the number of those, of known ages, who died from this disease in the eleven years, 1899-1909. Arranged, by sex, in age periods of five years each.*

Age periods.	Number of deaths.			Per cent.			Average deaths per year.		
	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.
Under 5 years.....	2,295	1,804	4,099	31.72	24.93	56.65	209	164	373
5 to 9 years.....	393	405	798	5.43	5.60	11.03	36	37	73
10 to 14 years.....	221	233	454	3.05	3.22	6.27	20	21	41
15 to 19 years.....	239	193	432	3.30	2.67	5.97	22	18	40
20 to 24 years.....	154	127	281	2.13	1.75	3.88	14	12	26
25 to 29 years.....	107	100	207	1.48	1.38	2.86	10	9	19
30 to 34 years.....	95	78	173	1.31	1.08	2.39	9	7	16
35 to 39 years.....	90	69	159	1.25	.95	2.20	8	6	14
40 to 44 years.....	81	58	139	1.12	.80	1.92	7	5	12
45 to 49 years.....	70	50	120	.97	.69	1.66	6	5	11
50 years and over.....	227	147	374	3.14	2.03	5.17	21	13	34
All ages.....	3,972	3,264	7,236	54.90	45.10	100.00	361	297	658

TABLE 33.—*The duration of sickness in fatal cases of meningitis, of known duration, in Michigan, in the nine years, 1901-1909. Arranged by sex, in five day periods.*

Duration periods.	Number of deaths.			Per cent.			Average deaths per year.		
	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.	Males.	Females.	Both sexes.
1 to 5 days.....	909	682	1,591	21.93	16.45	38.38	101	76	177
6 to 10 days.....	520	500	1,020	12.55	12.06	24.61	58	56	114
11 to 15 days.....	312	294	606	7.53	7.09	14.62	35	33	68
16 to 20 days.....	134	145	279	3.23	3.50	6.73	15	16	31
21 to 25 days.....	120	108	228	2.89	2.61	5.50	13	12	25
26 to 30 days.....	56	53	109	1.35	1.28	2.63	6	6	12
31 to 35 days.....	30	26	56	.72	.63	1.35	3	3	6
36 to 40 days.....	20	18	38	.48	.43	.91	2	2	4
41 to 45 days.....	20	13	33	.48	.32	.80	2	1	3
46 to 50 days.....	9	12	21	.22	.29	.51	1	1	2
51 days and over.....	85	79	164	2.05	1.91	3.96	9	9	18
Totals and averages.....	2,215	1,930	4,145	53.43	46.57	100.00	246	214	460

RESTRICTIVE AND PREVENTIVE MEASURES IN MENINGITIS.¹

As may be seen by reference to Table 34, information relative to the restrictive and preventive measures in meningitis has been very meagre.

As indicated by those reports in which a definite statement was made relative to the restrictive and preventive measures in meningitis in the six years, 1904-1909, but 24 per cent of the patients were isolated from all persons excepting the nurses and attending physicians. Practically the same showing is made in regard to the disinfection of the sputa. The disinfection of the bedding, clothing, etc., liable to be soiled by the sputa, was carried out in 46 per cent of the instances, and the disinfection of the rooms was enforced in 56 per cent of the cases.

TABLE 34.—*Restrictive and preventive measures in meningitis, in Michigan, in the six years, 1904-1909.*

Restrictive and preventive measures.	Number of cases.	Per cent.
ISOLATION:		
Enforced.....	908	24
Neglected.....	854	22
Not stated, or statements doubtful.....	2,040	54
DISINFECTION OF SPUTA:		
Enforced.....	991	*28
Neglected.....	474	*13
Not stated, or statements doubtful.....	2,129	*59
DISINFECTION OF BEDDING, CLOTHING, ETC., SOILED BY SPUTA:		
Enforced.....	1,674	*46
Neglected.....	386	*11
Not stated, or statements doubtful.....	1,534	*43
DISINFECTION OF ROOM OCCUPIED BY PATIENT:		
Enforced.....	2,114	56
Neglected.....	496	13
Not stated, or statements doubtful.....	1,192	21

*Two hundred and eight cases, in which there was said to be no sputa, excluded in making these per cents.

TYPHOID FEVER IN MICHIGAN IN 1909 AND PRECEDING YEARS.

GENERAL PREVALENCE.

By Table 35, it may be seen, that, in 1909, typhoid fever was less prevalent than in 1908, and more prevalent than in the average year.

TABLE 35.—*The prevalence of typhoid fever, in Michigan, in each of the twenty-six years* 1884-1909.*

Years.	Population.*	Reported cases.†	Reported deaths.	Deaths per 100 cases.	Deaths per 100,000 population.
1884.....	1,853,658	969	290	27	15.6
1885.....	1,893,697	715	194	23	10.2
1886.....	1,933,735	1,194	282	18	14.6
1887.....	1,973,774	3,424	411	17	20.8
1888.....	2,013,812	1,511	310	21	15.4
1889.....	2,053,851	2,530	681	27	33.2
1890.....	2,093,889	1,924	304	16	14.5
1891.....	2,130,827	4,670	697	15	32.7
1892.....	2,167,765	2,591	538	21	24.8
1893.....	2,204,703	3,512	594	17	26.9
1894.....	2,241,641	2,805	506	18	22.6
1895.....	2,271,531	3,751	621	17	27.3
1896.....	2,301,421	2,506	409	16	17.8
1897.....	2,331,311	1,900	352	19	15.1
1898.....	2,361,201	2,874	634	24	26.9
1899.....	2,391,091	3,194	638	20	26.7
1900.....	2,420,982	5,122	920	18	38.0
1901.....	2,450,872	3,002	665	22	27.1
1902.....	2,475,499	2,456	596	24	24.1
1903.....	2,502,758	2,840	640	23	28.9
1904.....	2,530,016	3,028	731	24	29.7
1905.....	2,557,275	2,774	661	24	25.8
1906.....	2,584,533	3,163	785	25	30.4
1907.....	2,611,792	1,953	645	33	24.7
1908.....	2,639,050	2,656	729	27	27.6
1909.....	2,666,309	2,694	692	26	26.0
Averages per year.....	2,294,500	2,683	559	21	24.3

*Estimated for intercensal years.

†Many health officers reported only the fatal cases, so that the total number of cases for each year was much in excess of those given in this column.

A comparison of Table 35 with Table 36 will show that the average death rate from typhoid fever in the years since 1884—when active measures for its restriction were instituted by this Department is considerably lower than in the fifteen years preceding 1884. It will also be seen that, in the years 1884-1897, inclusive, as a rule, the annual death rates were much lower than the rates in subsequent years. The higher death rates in the years 1898-1909 may be accounted for partly by the fact that, prior to 1898, under the old law for the registration of deaths, not all deaths were reported. It will be seen, however, that, in the twelve years ending with 1909, the death rates from typhoid fever have not decreased, as would be expected from the efforts put forth by this Department for the restriction of the disease. This is believed to be due to the fact that, in many localities which have public water supplies, there has been little, if any, provision made for the removal of sewage, necessitating a gradually increasing number of cesspools and resulting in a gradually increasing contamination of the underground bodies of water from which many persons in those localities derive their water supplies.

It is safe to say that no substantial decrease in the sickness and mortality from typhoid fever may be expected until every cesspool and shallow well shall have been abolished, and every public water supply permanently protected against contamination.

TABLE 36.—*The number of deaths from typhoid fever,* in Michigan, per 100,000 persons living, in each of the fifteen years, 1869-1883. Compiled from reports to the Secretary of State.*

Years.....	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
Deaths.....	39.0	48.5	29.2	49.4	52.8	45.8	31.3	30.1	30.3	22.6	25.5
Years.....	1880.	1881.	1882.	1883.	Average, 1869-1883.						
Deaths.....	31.9	55.2	28.4	25.0	36.3						

*Includes typho-malarial fever but not typhoid pneumonia.

GEOGRAPHICAL DISTRIBUTION.

Table 37 indicates that, in the nineteen years, 1891-1909, the death rate from typhoid fever in the Upper Peninsular Division was considerably higher than the average for the entire State for the same period (27.9 deaths per 100,000 inhabitants), and that this high death rate was due to unusual death rates in the counties of Baraga, Chippewa, Delta, Gogebic, Iron, Marquette and Menominee. The unusual death rates in each of these counties were due to high death rates, in certain years, in the following localities:

BARAGA COUNTY—Baraga township, 1891, 1899; Baraga village, 1891, 1899.

CHIPPEWA COUNTY—Superior township, 1899; Sault Ste. Marie city, 1893-4, 1900-6, 1908-9.

DELTA COUNTY—Escanaba city, 1892-3, 1897-1909; Gladstone city, 1898-1899, 1901-6, 1909.

GOGEBIC COUNTY—Bessemer City, 1893-4, 1896, 1900-1, 1909; Ironwood city, 1891, 1893, 1900, 1904-9.

IRON COUNTY—Hematite township, 1892; Iron River village, 1891, 1907-8; Crystal Falls city, 1891-2, 1906, 1908-9.

MARQUETTE COUNTY—Michigamme township, 1891, 1893; Republic township, 1891, 1893; Wells township, 1904; Ishpeming city, 1891-2, 1894, 1897-8, 1900, 1903, 1907; Marquette city, 1892, 1895, 1899-1900, 1902, 1904-9; Negaunee city, 1891-4, 1896, 1898, 1902, 1904-8.

MENOMINEE COUNTY—Spaulding township, 1891, 1909; Menominee city, 1891-6, 1899-1901, 1903-9.

In addition to the foregoing, in the counties of Emmet, Ingham, Kent, Midland, Missaukee, Otsego and Wexford, the death rate from typhoid fever in the nineteen years, 1891-1909, was much higher than the average for the State as a whole, but, by reason of the low death rates in the other counties in the same geographical divisions, the death rates of the geographical division in which these counties are located do not differ greatly from the average for the entire State. The high death rates in the six counties under consideration were due to high death rates, in certain years, in the following localities:

EMMET COUNTY—Little Traverse township, 1891; Springvale township, 1905; Harbor Springs village, 1891, 1893, 1895, 1897, 1903-6; Petoskey city, 1897-1902, 1906, 1908-9.

INGHAM COUNTY—Alaiedon township, 1899-1900; Aurelius township, 1896; Delhi township, 1891, 1894-5, 1898-9; Ingham township, 1898-9; Lansing township, 1901, 1903-4; Le Roy township, 1898; Leslie township, 1894; Locke township, 1903; Meridian township, 1899, 1900, 1903; Stockbridge township, 1891-2; Vevay township, 1902; White Oak township, 1900; Williamston township, 1891-2, 1898; Stockbridge village, 1900; Lansing city, 1891, 1893-8, 1900-6, 1908.

KENT COUNTY—Ada township, 1900; Byron township, 1899; Grand Rapids township, 1903; Lowell township, 1891; Paris township, 1900; Plainfield township, 1891, 1908; Sparta township, 1895, 1900; Walker township, 1894, 1899, 1903; Wyoming township, 1895, 1904-1907; Lisbon village, 1900; Sparta village, 1906, 1908; Grand Rapids city, 1891-1908.

MIDLAND COUNTY—Ingersoll township, 1898, 1908; Larkin township, 1900; Warren township, 1898, 1901, 1907; Coleman village, 1894; Midland City, 1895, 1899, 1901-2, 1904, 1907, 1909.

MISSAUKEE COUNTY—Norwich township, 1899, 1900; Reeder township, 1891, 1894-5, 1908; Richland township, 1893, 1900; Riverside township, 1891; Lake City village, 1893; McBain city, 1894, 1898.

OTSEGO COUNTY—Corwith township, 1891, 1899; Hayes township, 1900; 1891, 1894-5, 1908; Richland township, 1893, 1900; Riverside township, 1891; Lake City village, 1893; McBain city, 1894, 1898.

OTSEGO COUNTY—Corwith township, 1891, 1899; Hayes township, 1900; Gaylord village, 1891, 1898, 1900, 1902-4, 1909.

WEXFORD COUNTY—Boon township, 1892; Greenwood township, 1900, 1903; Slagle township, 1898; South Branch township, 1891; Springville township, 1894, 1898, 1900, 1908-1909; Harrietta village, 1892; Cadillac city, 1893, 1900-1901, 1903, 1905-6, 1908-1909.

TABLE 37.—*The geographical distribution of typhoid fever, in Michigan, in the nineteen years, 1891-1909, as indicated by the average number of cases and deaths, and the average deaths per 100,000 persons living, in each geographical division shown in the table.*

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
UPPER PENINSULAR DIVISION.....	247,980	536	87.8	35.4
Alger county.....	5,018	3	.5	10.0
Baraga county.....	4,856	22	2	41.2
Chippewa county.....	19,322	51	8	41.4
Delta county.....	24,005	44	14	58.3
Dickinson county.....	17,329	30	4	23.1
Gogebic county.....	16,144	74	8	49.6
Houghton county.....	59,292	78	14	23.6
Iron county.....	7,599	11	3	39.5
Keweenaw county.....	3,755	4	.7	18.6
Luce county.....	3,245	5	1	30.8
Mackinac county.....	7,835	4	.6	7.7
Marquette county.....	39,575	124	16	40.4
Menominee county.....	25,207	53	13	51.6
Ontonagon county.....	6,651	15	1	15.0
Schoolcraft county.....	8,147	18	2	24.5
NORTHWESTERN DIVISION.....	85,437	117	24	28.1
Benzie county.....	9,822	21	3	30.5
Grand Traverse county.....	21,094	39	7	33.2
Leelanau county.....	10,348	5	2	19.3
Manistee county.....	26,960	27	6	22.3
Wexford county.....	17,213	25	6	34.9
NORTHERN DIVISION.....	75,614	106	20.5	27.1
Antrim county.....	14,307	18	4	28.0
Charlevoix county.....	14,126	15	4	28.3
Cheboygan county.....	16,018	17	2	12.5
Crawford county.....	3,377	5	.5	14.8
Emmet county.....	14,778	27	5	33.8
Kalkaska county.....	6,780	9	2	29.5
Otsego county.....	6,228	15	3	48.2
NORTHEASTERN DIVISION.....	57,485	50	13.4	23.3
Alcona county.....	5,594	4	.7	12.5
Alpena county.....	19,160	14	5	26.1
Iosco county.....	11,316	8	3	26.5
Montmorency county.....	3,122	3	.6	19.2
Ogemaw county.....	7,623	8	2	26.2
Oscoda county.....	1,892	3	.1	5.3
Presque Isle county.....	8,778	10	2	22.8
WESTERN DIVISION.....	272,309	419	80	29.4
Kent county.....	132,753	295	47	35.4
Lake county.....	5,431	6	1	18.4
Mason county.....	19,354	18	6	31.0
Muskegon county.....	37,372	26	7	18.7
Newaygo county.....	18,788	19	6	31.9
Oceana county.....	17,392	23	4	23.0
Ottawa county.....	41,219	32	9	21.8
NORTHERN CENTRAL DIVISION.....	107,695	145	26.3	24.4
Clare county.....	8,755	12	2	22.8
Gladwin county.....	7,085	11	1	14.1
Isabella county.....	23,244	34	5	21.5
Mecosta county.....	25,863	22	6	23.2
Midland county.....	14,239	27	5	35.1
Missaukee county.....	8,967	20	3	33.5
Osceola county.....	17,870	17	4	22.4
Roscommon county.....	1,672	2	.3	17.9

*†These footnotes are below Table 35, on a preceding page.

TABLE 37.—CONCLUDED.

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
BAY AND EASTERN DIVISION.....	343,721	379	85.8	25.0
Arenac county.....	8,816	6	.8	9.1
Bay county.....	63,224	54	20	31.6
Huron county.....	34,149	29	6	17.6
Lapeer county.....	27,836	32	7	25.1
Saginaw county.....	84,485	69	16	18.9
Sanilac county.....	34,624	50	10	28.9
St. Clair county.....	55,098	100	18	32.7
Tuscola county.....	35,489	39	8	22.5
CENTRAL DIVISION.....	315,564	416	79.0	25.0
Barry county.....	22,755	22	3	13.2
Clinton county.....	25,667	39	7	27.3
Eaton county.....	31,603	45	7	22.1
Genesee county.....	41,865	47	10	23.9
Gratiot county.....	29,860	43	8	26.8
Ingham county.....	42,223	90	16	37.9
Ionia county.....	34,881	42	9	25.8
Livingston county.....	19,374	22	4	20.6
Montcalm county.....	33,831	27	8	23.6
Shiawassee county.....	33,505	39	7	20.9
SOUTHWESTERN DIVISION.....	140,928	153	32	22.7
Allegan county.....	39,107	29	7	17.9
Berrien county.....	48,040	50	12	25.0
Cass county.....	20,518	25	4	19.5
Van Buren county.....	33,263	49	9	27.1
SOUTHERN CENTRAL DIVISION.....	319,011	388	69	21.6
Branch county.....	26,150	29	6	22.9
Calhoun county.....	50,995	70	13	25.5
Hillsdale county.....	29,978	24	5	16.7
Jackson county.....	46,937	78	12	25.6
Kalamazoo county.....	46,768	78	10	21.4
Lenawee county.....	48,888	59	12	24.5
St. Joseph county.....	24,024	20	4	16.7
Washtenaw county.....	45,271	30	7	15.5
SOUTHEASTERN DIVISION.....	459,215	295	118	25.7
Macomb county.....	32,798	39	8	24.4
Monroe county.....	33,101	37	7	21.1
Oakland county.....	44,463	31	8	18.0
Wayne county.....	348,853	188	95	27.3

*†These footnotes are below Table 35, on a preceding page.

THE PREVALENCE OF TYPHOID FEVER IN URBAN AND RURAL LOCALITIES.

Table 38 indicates that, in 1909, typhoid fever was much more prevalent in urban than in rural localities.

In the urban localities typhoid fever was most prevalent in the group of localities having populations of from 10,000 to 25,000 and least prevalent in the group having 50,000 inhabitants and over.

By comparison of death rates in Table 38 with the death rate from typhoid fever in 1909 for the State as a whole, shown in Table 35, it will be seen that the death rate for the third group of localities in Table 38, is considerably higher than the rate for the entire State.

The localities in each of the first four groups in Table 38, together with the reported cases and deaths from typhoid fever in each locality in 1909, and in the average year, are shown in Table 38A.

By Table 38A it may be seen that, in 1909, the urban localities which showed much higher death rates from typhoid fever than the death rate for this disease for the entire State for that year were: Adrian, Alpena, Battle Creek, Bay City, Benton Harbor, Cadillac, Escanaba, Flint, Hancock, Ironwood, Ludington, Marquette, Menominee, Mt. Clemens, Niles, Petoskey, Port Huron, St. Joseph, Sault Ste. Marie, Traverse City and Wyandotte.

The localities, shown in Table 38A, in which the death rates from typhoid fever were much lower in 1909 than the rate for the entire State for that year were: Charlotte, Cheboygan, Coldwater, Grand Haven, Hillsdale, Holland, Ishpeming, Kalamazoo, Laurium, Monroe, Mt. Pleasant and Ypsilanti.

The localities, shown in Table 38A, which showed much higher death rates from typhoid fever in 1909 than the average for such localities in the years 1904-1908, were: Adrian, Alpena, Ann Arbor, Benton Harbor, Calumet township, Coldwater, Flint, Hancock, Holland, Ironwood, Ludington, Niles, Owosso, Petoskey, Port Huron and St. Joseph.

The localities, shown in Table 38A, which showed much lower death rates from typhoid fever in 1909 than the average for such localities in the years 1904-1908, were: Grand Rapids, Ishpeming, Kalamazoo, Lansing and Laurium.

By Table 38B is shown the number of cases of typhoid fever that would have been expected to occur in 1909, in cities over 5,000 inhabitants, according to an estimated rate of ten cases to one death. This table is merely an experiment, yet it may prove of value, as the future will show.

TABLE 38.—*The prevalence of typhoid fever in urban and rural localities, in Michigan, in 1909.*

Localities—Grouped according to density of population.	Population.*	Health jurisdictions.			Cases.†	Deaths.	Death rates per 100,000 of the population.
		Total.	Infected.				
			Number.	Per cent of all jurisdictions.			
Cities over 50,000.....	524,498	3	3	100	355	34	25.5
Cities from 25,000 to 50,000.....	154,255	5	5	100	204	44	28.5
Cities from 10,000 to 25,000 and Calumet township (18,628).....	222,289	16	16	100	429	118	53.1
Cities and villages from 5,000 to 10,000.....	185,982	28	25	89	238	58	31.2
Cities and villages under 5,000‡.....	352,905	325	132	41	575	101	28.6
Total urban.....	1,439,929	377	181	48	1,801	455	31.6
Balance of localities—principally townships§....	1,226,380	1,284	416	32	893	237	19.3

*†These footnotes are below Table 35, on a preceding page.

‡Exclusive of 57 cities and villages, for which the population in 1909 cannot be correctly estimated.

§Includes the 57 cities and villages mentioned in the preceding paragraph, but does not include Calumet township, which, for the purpose of this study, is included in the third group of urban localities, which have corresponding populations.

TABLE 38A.—*The prevalence of typhoid fever in 1909, and preceding years, in each of the principal localities included in the first four groups in Table 38.*

Localities.	1909.				Average, 1904-1908.			
	Popula- tion.*	Cases.	Deaths.	Deaths per 100,000 inhab- itants.	Popula- tion.*	Cases.	Deaths.	Deaths per 100,000 inhab- itants.
Adrian.....	11,963	16	4	33.4	11,193	†	2	17.9
Albion.....	5,473	1	0	.....	5,155	5	.4	7.8
Alpena.....	13,148	23	8	60.8	12,699	†	4	31.5
Ann Arbor.....	14,712	9	3	20.4	14,643	10	2	13.7
Battle Creek.....	26,776	40	10	37.3	24,038	44	9	37.4
Bay City.....	40,509	†	17	42.0	37,989	†	†18	47.4
Benton Harbor.....	6,877	27	4	58.2	6,772	4	1	14.8
Big Rapids.....	5,060	0	0	.....	4,935	5	2	40.5
Cadillac.....	8,013	10	3	37.4	7,341	19	3	40.9
Calumet township.....	18,628	38	4	21.5	17,813	18	2	11.2
Charlotte.....	5,519	5	1	18.1	5,043	9	1	19.8
Cheboygan.....	7,032	10	1	14.2	6,851	3	.8	11.7
Coldwater.....	6,237	3	1	16.0	6,230	5	.4	6.4
Detroit.....	366,646	†	95	25.9	338,435	†	86	25.4
Escanaba.....	13,035	†	29	222.5	11,873	†	23	193.7
Flint.....	17,111	164	22	128.6	15,775	§14	7	44.4
Grand Haven.....	5,859	4	1	17.1	5,487	4	1	18.2
Grand Rapids.....	105,910	229	23	21.7	99,795	383	44	44.1
Hancock.....	8,521	14	6	70.4	7,030	†	3	42.7
Hillsdale.....	5,632	12	1	17.8	5,138	5	1	19.5
Holland.....	10,436	16	2	19.2	9,554	8	1	10.5
Houghton.....	5,581	0	0	.....	4,839	†	.4	8.3
Ionia.....	5,239	10	0	.....	5,229	†9	3	57.4
Iron Mountain.....	7,764	0	0	.....	8,256	†	1	12.1
Ironwood.....	10,412	†	9	86.4	10,176	†	5	49.1
Ishpeming.....	9,583	2	1	10.4	10,807	†9	2	18.5
Jackson.....	25,450	60	8	31.4	25,360	72	9	35.5
Kalamazoo.....	36,505	26	3	8.2	32,471	68	10	30.8
Lansing.....	25,015	61	6	24.0	22,172	†48	12	54.1
Laureum.....	10,166	†	1	9.8	8,658	†	2	23.1
Ludington.....	7,376	26	7	94.9	7,306	†4	2	27.4
Manistee.....	10,768	12	3	27.9	11,932	16	3	25.1
Manistique.....	5,184	1	0	.....	4,831	4	1	20.7
Marquette.....	11,424	†	5	43.8	10,969	18	6	54.7
Menominee.....	8,944	†	9	100.6	10,235	†	10	97.7
Monroe.....	7,485	14	1	13.4	6,671	2	1	15.0
Mt. Clemens.....	7,773	†	3	38.6	7,374	†16	3	40.7
Mt. Pleasant.....	5,512	6	1	18.1	4,895	15	1	20.4
Muskegon.....	20,995	19	0	.....	20,937	21	6	28.7
Negaunee.....	6,625	12	0	.....	6,728	17	4	59.5
Niles.....	5,084	12	2	39.3	4,819	6	.4	8.3
Norway.....	5,732	1	0	.....	5,211	5	.8	15.4
Owosso.....	9,707	†	3	30.9	9,370	†5	2	21.3
Petoskey.....	5,062	23	4	79.0	5,136	13	2	38.9
Pontiac.....	12,278	10	3	24.4	11,442	†	3	26.2
Port Huron.....	21,116	†	11	52.1	20,463	23	8	39.1
Saginaw.....	51,942	†	16	30.8	48,743	51	16	32.8
St. Joseph.....	5,531	†	2	36.2	5,406	5	1	18.5
Sault Ste. Marie.....	12,572	23	7	55.7	11,894	†25	6	50.4
Traverse City.....	13,525	26	7	51.8	12,152	56	6	49.4
Wyandotte.....	5,728	26	6	104.7	5,546	†	6	108.2
Ypsilanti.....	7,849	3	1	12.7	7,692	†4	.8	10.4

*Estimated for intercensal years.

†Fatal cases only reported.

‡Does not include West Bay City for 1904, which was consolidated with Bay City in 1905.

§Average for three years only.

||Average for four years only.

¶Average for two years only.

TABLE 3SB.—*The number of cases and deaths from typhoid fever reported from each of certain localities of 5,000 inhabitants and over, in Michigan, in 1909, together with the fatality (deaths per 100 reported cases) and the number of cases that would be expected to occur according to a rate of ten deaths to each 100 cases.*

Localities.	Reported cases.	Deaths.	Deaths per 100 reported cases.	The expected number of cases.
Adrian.....	16	4	25	40
Alpena.....	23	8	34	80
Ann Arbor.....	9	3	33	30
Battle Creek.....	40	10	25	100
Bay City.....	17	17	100	170
Benton Harbor.....	27	4	15	40
Cadillac.....	10	3	30	30
Calumet township.....	38	4	11	40
Charlotte.....	5	1	20	10
Cheboygan.....	10	1	10	10
Coldwater.....	3	1	33	10
Detroit.....	95	95	100	950
Escanaba.....	44	29	66	290
Flint.....	164	22	13	220
Grand Haven.....	4	1	25	10
Grand Rapids.....	229	23	10	230
Hancock.....	14	6	43	60
Hillsdale.....	12	1	8	10
Holland.....	16	2	13	20
Ironwood.....	9	9	100	90
Ishpeming.....	2	1	50	10
Jackson.....	60	8	13	80
Kalamazoo.....	26	3	11	30
Lansing.....	61	6	10	60
Ludington.....	26	7	27	70
Manistee.....	12	3	25	30
Marquette.....	7	5	71	50
Menominee.....	9	9	100	90
Monroe.....	14	1	7	10
Mt. Clemens.....	3	3	100	30
Mt. Pleasant.....	6	1	16	10
Niles.....	12	2	17	20
Owosso.....	3	3	100	30
Petoskey.....	23	4	17	40
Pontiac.....	10	3	30	30
Port Huron.....	13	11	85	110
Saginaw.....	34	16	47	160
St. Joseph.....	2	2	100	20
Sault Ste. Marie.....	23	7	30	70
Traverse City.....	26	7	27	70
Wyandotte.....	26	6	23	60
Ypsilanti.....	3	1	33	10

THE REPORTED SOURCES OF CONTAGIUM IN TYPHOID FEVER.

In the nineteen years, 1891-1909, over sixty-six per cent of all the cases of typhoid fever were not traced to their source. This is to be regretted, because if in any outbreak of typhoid fever, the source of the disease is promptly located and removed, and proper measures taken to prevent the further spread of the disease from the sick person, or persons, the disease may usually be restricted to those persons who were infected prior to the recognition of the disease at the beginning of the outbreak.

Of the cases of typhoid fever in which a source of contagium was given, as shown in Table 39 nearly fifty-seven per cent were said to be due to water or ice. This number would be much greater if the sources of all the cases were traced. For instance, in Grand Rapids, which has a contaminated

public water supply, there are several hundred cases of typhoid fever in each year, most of which are undoubtedly due to the water supply, and yet a source is not usually reported. This is also true of many other localities in which the water supplies are the undoubted sources of the typhoid fever, but the connection is not traced or reported to this Department.

The comparatively large number of cases in which the infection was traced to outside jurisdictions, included, principally, those cases in which the patients were taken sick in a camp, or other place, away from home, and were removed to their homes, or to a hospital, in other health jurisdictions, to be cared for. The localities from which and to which typhoid fever was spread in 1909 are shown in Table 40.

The removal, from one locality to another, of a person suffering from typhoid fever is a dangerous practice, and is unlawful unless the same is done with the consent and under the supervision of the health officials of the locality to which the patient is to be removed.

The 2,775 cases which were said to be due to coming in contact with or nursing typhoid fever patients were probably due, in the main, to the neglect of proper precautions on the part of those in attendance upon the patients. Where the utmost care and cleanliness is observed by those in charge of cases of typhoid fever, cases due to secondary infection should be of rare occurrence. It often happens, however, that the nursing is done by some member of the family, who may also handle food, or assist in the preparation of meals, to be eaten by herself and other members of the family; and the hands may not always be disinfected and cleansed between the act of caring for the patient and the handling of the food.

It is probable that many of the cases of typhoid fever which occurred in the same household, camp, etc., and which were reported as due to secondary infection, were really due to the same source as the original case, or to primary infection.

An insanitary condition of premises, on which a case of typhoid fever occurred, would be considered a cause of typhoid fever only in so far as it might assist in the development and distribution of the germs of the disease. Thus, a badly constructed or neglected privy or cesspool might be an eyesore or a source of discomfort to those in the immediate vicinity for many years, and yet not be a cause of typhoid fever. Further, the leachings from such privy or cesspool might find their way into and contaminate the water supply, and the water be consumed without any apparent danger to those using it. But with the entrance to such privy or cesspool of the discharges from a person suffering, or recently recovered, from typhoid fever, these receptacles would then become centers of infection, and a positive danger to those living in their immediate vicinity, and to those using the water from any source into which the leachings from such receptacles might find their way. It is probable that very many of the 1,438 cases of typhoid fever in Table 39, attributed to insanitary surroundings, were due to infected water, and, in some instances, to infected milk or other food.

Cases of typhoid fever due to infected food are difficult to trace, and it is probable that the one per cent of cases, shown in Table 39, attributed to this source, does not nearly represent the actual number of cases resulting therefrom.

The cases of typhoid fever due to milk infection are probably represented to a considerable extent by the number of deaths from this disease in children under five years of age; and which constitute about four and one-half per cent of all the deaths from this disease.

The transmission of typhoid fever by flies is believed to play a more important part in the spreading of this disease than is generally supposed, but the connection between this source and individual cases of the disease cannot ordinarily be traced by those in charge of the public health service of the State. Wherever a common privy exists, there will always be a possibility of the infection of the contents of the pit by the discharges from an incipient or ambulatory case of typhoid fever, and a strong probability of its infection during and for some time subsequent to an outbreak of this disease on the premises where the privy is located. As there is little, if any, effort made to exclude the common house-fly from the common privies, and, in many instances, a very imperfect exclusion of them from our homes, from stores where articles of food are exposed for sale, and from the rooms where cases of typhoid fever are present, the probability of infection of food in the home and in the store is ever present.

It is possible that some of the 28 cases of typhoid fever, in Table 39, attributed to infected houses and articles of clothing, etc., were really due to infection in a well, privy or cesspool, rather than to infection in the house itself.

TABLE 39.—*The principal reported sources of contagium in 19,239 cases of typhoid fever, in Michigan, in the nineteen years, 1891-1909.*

Reported sources.	Number of cases.	Per cent of cases in which the source was known.
Water and ice.....	10,902	56.7
Outside jurisdictions.....	3,801	19.8
Traced to former cases in same locality.....	2,775	14.4
Insanitary surroundings, defective sewerage, filth, etc.....	1,438	7.5
Milk and other foods.....	248	1.3
Flies.....	47	.2
Infected houses and articles of clothing, etc.....	28	.1
Sources not stated or doubtful.....	38,252	*66.4

*Per cent of all cases which were reported.

TABLE 40.—*Localities from which and to which typhoid fever was spread during the year 1909.*

Spread from:	To:	Spread from:	To:
Allegan county, Manlius township.	Ottawa county, Holland city.	Emmet county, Bear Creek township.	Emmet county, Petoskey city.
Allegan county, Saugatuck village.	Ottawa county, Holland city.	Emmet county, Petoskey city.	Kalamazoo county, Kalamazoo city.
Bay county, Bay City city.	Charlevoix county, Charlevoix city.	Emmet county, Petoskey city.	Montcalm county, Richland township.
Benzie county, Homestead township.	Antrim county, Elk Rapids village.	Genesee county, Flint city.	Arenac county, Clayton township.
Calhoun county, Battle Creek city.	St. Clair county, Emmett township.	Genesee county, Flint city.	Genesee county, Thetford township.
Cass county, Wayne township.	Van Buren county, Hamilton township.	Genesee county, Flint city.	Gladwin county, Tobacco township.
Charlevoix county, Boyne City city.	Presque Isle county, Onaway city.	Genesee county, Flint city.	Iosco county, East Tawas city.
Cheboygan county, Mackinaw City village.	Presque Isle county, Onaway city.	Genesee county, Flint city.	Iosco county, Tawas City city.
Chippewa county, Bruce township.	Chippewa county, Sault Ste. Marie city.	Genesee county, Flint city.	Isabella county, Mt. Pleasant city.
Chippewa county, Sault Ste. Marie city.	Menominee county, Spalding township.	Genesee county, Flint city.	Lapeer county, Mayfield township.
Chippewa county, Sault Ste. Marie city.	Ontonagon county, Greenland township.	Genesee county, Flint city.	Oakland county, Troy township.
Clinton county, St. Johns city.	Clinton county, Bath township.	Genesee county, Flint city.	Saginaw county, Birch Run township.
Delta county, Escanaba city.	Delta county, Ford River township.	Genesee county, Flint city.	Tuscola county, Tuscola township.
Delta county, Escanaba city.	Iron county, Crystal Falls city.	Gladwin county, (No locality given).	Bay county, Williams township.
Delta county, Gladstone city.	Osceola county, Richmond township.	Gogebic county, Bessemer township.	Calhoun county, Clarendon township.
Eaton county, Eaton Rapids city.	Shiawassee county, Morrice village.	Gogebic county, Watersmeet township.	Delta county, Escanaba city.

TABLE 40.—CONTINUED.

Spread from:	To:	Spread from:	To:
Gratiot county, Alma city.	Gratiot county, Bethany township.	Kalkaska county, Kalkaska village.	Mason county, Ludington city.
Gratiot county, Ithaca village.	Gratiot county, St. Louis city.	Kalkaska county, (No locality given).	Osceola county, Rose Lake township.
Gratiot county, Pine River township.	Gratiot county, St. Louis city.	Kent county, Grand Rapids city.	Allegan county, Saugatuck village.
Hillsdale county, Ransom township.	Jackson county, Concord township.	Kent county, Grand Rapids city.	Charlevoix county, Charlevoix city.
Hillsdale county, Waldron village.	Hillsdale county, Wright township.	Kent county, Grand Rapids city.	Montcalm county, Greenville city.
Ingham county, Lansing city.	Gratiot county, Newark township.	Kent county, Grand Rapids city.	Newaygo county, Bridgeton township.
Ingham county, Lansing city.	Wayne county, Northville village.	Lapeer county, North Branch village.	Tuscola county, Vassar village.
Ionia county, Belding city.	Kent county, Courtland township.	Lenawee county, Adrian city.	Hillsdale county, Hillsdale city.
Iosco county, Wilber township.	Iosco county, East Tawas city.	Livingston county, Brighton village.	Livingston county, Cohoctah township.
Iron county, Crystal Falls city.	Dickinson county, Sagola township.	Luce county, Newberry village.	Tuscola county, Almer township.
Jackson county, Jackson city.	Lenawee county, Rollin township.	Mackinac county, (No locality given).	Chippewa county, Sault Ste. Marie city.
Jackson county, Jackson city.	Washtenaw county, Webster township.	Manistee county, Manistee city.	Manistee county, Onkama village.
Jackson county, Parma village.	Allegan county, Wayland village.	Midland county, Midland city.	Midland county, Hope township.
Jackson county, Parma village.	Jackson county, Hanover township.	Midland county, Midland city.	Midland county, Ingersoll township.
Kalamazoo county, Cooper township.	Kalamazoo county, Kalamazoo city.	Monroe county, Bedford township.	Monroe county, Erie township.
Kalamazoo county, Kalamazoo city.	Berrien county, Watervliet village.	Monroe county, Monroe city.	Monroe county, La Salle township.

TABLE 40.—CONTINUED.

Spread from:	To:	Spread from:	To:
Oakland county, Pontiac city.	Oakland county, Pontiac township.	Wayne county, Detroit city.	Alpena county, Alpena city.
Oakland township, Pontiac city.	Tuscola county, Kingston township.	Wayne county, Detroit city.	Hillsdale county, Reading village.
Ogemaw county, West Branch city.	Livingston county, Hartland township.	Wayne county, Detroit city.	Huron county, Bad Axe city.
Ontonagon county, Ontonagon village.	Ontonagon county, Greenland township.	Wayne county, Detroit city.	Leelanau county, Bingham township.
Osceola county, Marion village.	Wexford county, Cadillac city.	Wayne county, Detroit city.	Livingston county, Cohoctah township.
Oscoda county, Comins township.	Oscoda county, Big Creek township.	Wayne county, Detroit city.	Washtenaw county, Ypsilanti city.
Saginaw county, Saginaw city.	Tuscola county, Caro village.	Wayne county, Monguagon township.	Livingston county, Deerfield township.
St. Clair county, St. Clair city.	Macomb county, Chesterfield township.	Wexford county, Manton village.	Emmet county, Harbor Springs village.
St. Joseph county, Three Rivers city.	Ottawa county, Wright township.	Wexford county, Mesick village.	Clinton county, Essex township.
Sanilac county, Deckerville village.	Sanilac county, Bridgehampton township.	FROM OUTSIDE THE STATE TO LOCALITIES IN MICHIGAN.	
Sanilac county, Melvin village.	Sanilac county, Maple Valley township.	Spread from:	To:
Sanilac county, Sandusky city.	Sanilac county, Lamotte township.	Colorado, (No locality given).	Clinton county, Elsie village.
Sanilac county, Sandusky city.	St. Clair county, Grant township.	Canada, Three Rivers.	Cheboygan county, Cheboygan city.
Tuscola county, Akron township.	Bay county, Monitor township.	Canada, Windsor.	Branch county, Quincy village.
Washtenaw county, Ypsilanti city.	Monroe county, Bedford township.	Dakota, (No locality given).	Lapeer county, Dryden township.
Washtenaw county, Ypsilanti city.	St. Clair county, Grant township.	Illinois, Chicago.	Branch county, Batavia township.

TABLE 40.—CONCLUDED.

Spread from:	To:	Spread from:	To:
Illinois, Chicago.	Calhoun county, Homer village.	Ohio, Cleveland.	Genesee county, Flushing village.
Illinois, Chicago.	Osecola county, Sherman township.	Ohio, Cleveland.	St. Clair county, Clay township.
Illinois, Chicago.	Ottawa county, Holland city.	Ohio, Fayette.	Hillsdale county, Wright township.
Indiana, Michawaka.	St. Joseph county, Park township.	Ohio, (No locality given).	Ionia county, Ionia city.
Indiana, (No locality given).	Charlevoix county, Charlevoix city.	Ohio, (No locality given).	Isabella county, Union township.
Indiana, (No locality given).	Ionia county, Lake Odessa village.	Ohio, (No locality given).	Lenawee county, Fairfield township.
Indiana, (No locality given).	Ionia county, Muir village.	Ohio, Toledo.	Monroe county, La Salle township.
Indiana, South Bend.	Berrien county, Niles city.	Ontario, Cobalt.	Chippewa county, Sault Ste. Marie city.
Kansas, Topeka.	Genesee county, Forest township.	Pennsylvania, (No locality given).	St. Joseph county, Constantine village.
Minnesota, Minneapolis.	Ontonagon county, Stanard township.	Tennessee, (No locality given).	St. Clair county, Kimball township.
Minnesota, (No locality given).	Berrien county, Niles city.	Wisconsin, Cedar Grove.	Ottawa county, Holland city.
Minnesota, (No locality given).	Dickinson county, Norway city.	Wisconsin, Milwaukee.	Van Buren county, South Haven city.
Montana, (No locality given).	Berrien county, New Buffalo village.	Wisconsin, Niagara.	Marquette county, Forsyth township.
North Carolina, High Point.	Mason county, Ludington city.		

RESTRICTIVE AND PREVENTIVE MEASURES.

Table 41 indicates that, in 1905-9, in a large number of instances, the disinfection of the discharges, and of clothing and other articles soiled by the discharges, of typhoid fever patients, was enforced. This is very gratifying, because it is through the discharges that the disease is spread. This does not, however, include the discharges from patients prior to the recognition of the disease and for some time subsequent to apparent recovery, nor the discharges from ambulatory cases which are seldom, if ever, recognized, all of which are believed to be fruitful sources of the disease.

The disinfection of rooms in which the patients were sick was enforced in 73 per cent of the cases. This shows a much greater recognition of the importance of this precautionary measure than was reported in the single year 1905.

Judging by the per cent of cases in which the isolation of the patient was enforced, the necessity for this restrictive measure is quite generally recognized. This is also true, though to a less extent, in respect to the placarding of premises. It is sometimes urged that if proper precautions are taken in the care of typhoid fever patients the isolation of the sick and the placarding of premises are not necessary. To this it should be stated, that inasmuch as strict precautions are not always observed in such cases, and for the further reason that many prominent medical men, in this and other countries, are advocates of the theory of the communicability of typhoid fever directly from patient to nurse, and to others who may come in contact with them, members of the families of those sick, other than those who may be in attendance upon the sick, should be excluded from the sick room, and the public should be warned against visiting the houses, and especially against drinking the water from any wells or making use of any outhouses on the premises where the disease is present.

The boiling of the drinking water, in cases where the water supplies were believed to have been the sources of the typhoid fever, was carried out in 57 per cent of the cases. The boiling of suspected water, for drinking and domestic purposes, does not entail much time and labor, and is an absolute safeguard against the communication of typhoid fever through this agency. There is an objection, however, especially in very warm weather, to the drinking of water which has been boiled and thus rendered insipid, but the protection which the boiling affords should more than offset any objection of this nature.

In 1908, a question relative to the source of water supply for domestic purposes, in outbreaks of typhoid fever, was added to the blanks for the Health Officer's Final Report to this Department, and in 1908 and 1909, the following information relative to this question was obtained: Tubular wells, 1,228, public water 1,307, surface wells 116, artesian wells 88, springs 86 and creeks 24, wells, not specified, 1,199 and rivers 6.

In April, 1907, it was recommended by this Department that all privies used by typhoid fever patients should be disinfected, and this question was added to the final report of cases of typhoid fever. Judging from the per cent of cases in which this restrictive measure was carried out in 1908, 72 per cent, its necessity is quite generally recognized.

TABLE 41.—*Restrictive and preventive measures in typhoid fever, in Michigan, in the five years, 1905-1909.*

Restrictive and preventive measures.	Number of cases.	Per cent of all cases.
PLACARDING OF PREMISES:		
Enforced.....	8,279	*63
Neglected, not stated or statements doubtful.....	4,881	*37
ISOLATION OF SICK PERSONS:		
Enforced.....	9,863	75
Neglected.....	1,196	9
Not stated or statements doubtful.....	2,181	16
DISCHARGES FROM THE BOWELS AND BLADDER:		
Disinfected.....	10,587	80
Not disinfected.....	448	4
Not stated or statements doubtful.....	2,105	16
CLOTHING AND OTHER ARTICLES SOILED BY DISCHARGES:		
Disinfected.....	10,972	83
Not disinfected.....	235	2
Not stated or statements doubtful.....	2,033	15
INFECTED ROOMS:		
Disinfected.....	9,649	73
Not disinfected.....	1,187	9
Not stated or statements doubtful.....	2,404	18
DRINKING WATER:		
Boiled during the period of sickness.....	†630	57
Not boiled.....	†362	33
Not stated or statements doubtful.....	†107	10
PROTECTION AGAINST FLIES:		
Houses screened during fly time.....	‡6,217	68
Not screened.....	‡842	9
Not stated or statements doubtful.....	‡2,084	23

*Placarding was not considered necessary in 80 instances, in which the patients were confined in hospitals or pest houses, therefore this number has been deducted from the 13,240 cases reported during the five years, before making these per cents.

†These figures represent the number of cases which were definitely traced, or believed to have been due to drinking infected water.

‡Of the 13,240 cases of typhoid fever in the five years, 1905-1909, 4,097 occurred in months when there were no flies, consequently no necessity for screening; therefore the 4,097 cases are not included in these figures.

DIPHTHERIA AND CROUP IN MICHIGAN IN 1909 AND PRECEDING YEARS.

GENERAL PREVALENCE.

During the year 1909, diphtheria was reported present in 2,455 households, with totals of 3,109 cases and 397 deaths, an average of 1.27 cases and .16 deaths per household.

In 1909, compared with the average for the fifteen years, 1894-1908, the number of cases were practically the same, while the deaths were 27 per cent less.

By reference to Table 42, it may be seen that in the sixteen years, 1894-1909, the average number of cases and deaths, the average deaths per 100 cases and the average death rate per 100,000 of the population, were much less than the average for the ten preceding years. The reason for this decrease will be considered in connection with Table 50, on a subsequent page of this article.

Going back still further, by reference to Table 43, we find that in the fifteen years, 1869-1883, the average death rate was about 58.5 per 100,000 of the population, a rate not equalled in any subsequent year. This high rate was due to the unusual rates for each of the years 1879-1882, the maximum of 145.2 deaths per 100,000 being reached in 1881. In the last year named, active measures for the restriction of diphtheria were begun by the State Department of Health, and Tables 42 and 43 show a much lower death rate for each year since that time, especially in the last ten years.

TABLE 42.—*The prevalence of diphtheria, in Michigan, during the ten years, 1884-1893, and before the use of antitoxin; also a similar statement for the sixteen years, 1894-1909, since the beginning of the general use of antitoxin.*

Years.	Population.*	Reported cases.	Reported deaths.	Deaths per 100 cases.	Deaths per 100,000 population.
1884.....	1,853,658	3,915	905	23.1	48.8
1885.....	1,893,697	4,018	964	24.0	50.9
1886.....	1,933,735	4,244	982	23.1	50.8
1887.....	1,973,774	3,382	825	24.4	41.8
1888.....	2,013,812	2,228	532	23.9	26.4
1889.....	2,053,851	3,157	683	21.6	33.3
1890.....	2,093,889	4,206	1,050	25.0	50.1
1891.....	2,130,827	4,385	1,002	22.9	47.0
1892.....	2,167,765	4,818	1,099	22.8	50.7
1893.....	2,204,703	4,736	1,092	23.1	49.5
Averages 1884-1893.....	2,031,971	3,909	913	23.4	44.9
1894.....	2,241,641	3,852	744	19.3	33.2
1895.....	2,271,531	3,433	708	20.6	31.2
1896.....	2,301,421	4,013	757	18.9	32.9
1897.....	2,331,311	4,132	756	18.3	32.4
1898.....	2,361,201	2,357	477	20.2	20.2
1899.....	2,391,091	2,154	435	20.2	18.2
1900.....	2,420,982	2,706	528	19.5	21.8
1901.....	2,450,872	2,498	493	19.7	20.1
1902.....	2,475,499	2,993	500	†16.4	20.2
1903.....	2,502,758	3,670	569	15.5	22.7
1904.....	2,530,016	3,510	538	15.3	21.3
1905.....	2,557,275	2,159	465	21.5	18.2
1906.....	2,584,533	3,648	453	12.4	17.5
1907.....	2,611,792	2,935	388	13.2	14.9
1908.....	2,639,050	2,658	327	12.3	12.4
1909.....	2,666,309	3,109	397	12.8	14.9
Averages 1894-1909.....	2,458,580	3,114	533	17.1	21.7

*Estimated for intercensal years.

†Exclusive of the cases in the cities of Muskegon and Sault Ste. Marie, from which only the fatal cases were reported in this year.

TABLE 43.—*The number of deaths from diphtheria and croup, in Michigan, per 100,000 persons living, in each of the fifteen years, 1869-1883. Compiled from reports to the Secretary of State.*

Years.....	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
Deaths.....	17.0	20.9	22.5	28.2	29.6	26.2	26.9	34.7	50.6	72.8	110.5
Years.....	1880.	1881.	1882.	1883.	Average, 1869-1883.						
Deaths.....	113.9	145.2	102.1	75.7	58.5						

GEOGRAPHICAL DISTRIBUTION IN DIPHTHERIA.

Table 44 shows that, as indicated by the number of deaths per 100,000 inhabitants in the nineteen years, 1891-1909, diphtheria was much more prevalent than the average for the entire State (25.6 per 100,000 population), in the Northeastern and Southeastern Divisions.

The counties in which the death rates from diphtheria were unusually high in the nineteen years, 1891-1909, placed in the order of greatest death rates, are:

Roscommon*	with a death rate of 119.6 per 100,000										
Presque Isle.....	"	"	"	"	"	"	"	"	56.9	"	"
Gogebic.....	"	"	"	"	"	"	"	"	55.7	"	"
Alcona.....	"	"	"	"	"	"	"	"	53.6	"	"
Wayne.....	"	"	"	"	"	"	"	"	52.5	"	"
Cheboygan.....	"	"	"	"	"	"	"	"	43.7	"	"
Alpena.....	"	"	"	"	"	"	"	"	41.8	"	"
Bay.....	"	"	"	"	"	"	"	"	41.1	"	"
Dickinson.....	"	"	"	"	"	"	"	"	40.4	"	"
Marquette.....	"	"	"	"	"	"	"	"	40.4	"	"
Huron.....	"	"	"	"	"	"	"	"	38.1	"	"
Lake.....	"	"	"	"	"	"	"	"	36.8	"	"
Iosco.....	"	"	"	"	"	"	"	"	35.3	"	"
Midland.....	"	"	"	"	"	"	"	"	35.1	"	"
Arenac.....	"	"	"	"	"	"	"	"	34.0	"	"
Otsego.....	"	"	"	"	"	"	"	"	32.1	"	"
Montmorency.....	"	"	"	"	"	"	"	"	32.0	"	"

*The amazingly high death rate in this county was due to an outbreak of so-called sore throat in 1893, of which the particulars were given in the annual report of this Department for 1894. The high rates in other counties were due, in the main, to epidemics in one or more of the eighteen years for which the rates are computed.

TABLE 44.—*The geographical distribution of diphtheria, in Michigan, in the nineteen years, 1891-1909, as indicated by the average number of cases and deaths, and the average deaths per 100,000 persons living, in each geographical division shown in the table.*

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
UPPER PENINSULAR DIVISION.....	247,980	393.6	69.1	27.9
Alger county.....	5,018	5	.8	15.9
Baraga county.....	4,856	1	.3	6.2
Chippewa county.....	19,322	15	4	20.7
Delta county.....	24,005	23	4	16.7
Dickinson county.....	17,329	36	7	40.4
Gogebic county.....	16,144	45	9	55.7
Houghton county.....	59,292	81	14	23.6
Iron county.....	7,599	11	2	26.3
Keweenaw county.....	3,755	5	1	26.6
Luce county.....	3,245	.6	.2	6.2
Mackinac county.....	7,835	5	.8	10.2
Marquette county.....	39,575	115	16	40.4
Menominee county.....	25,207	27	6	23.8
Ontonagon county.....	6,651	15	2	30.1
Schoolcraft county.....	8,147	9	2	24.5
NORTHWESTERN DIVISION.....	85,437	82	13.8	16.2
Benzie county.....	9,822	7	.8	8.1
Grand Traverse county.....	21,094	20	4	19.0
Leelanau county.....	10,348	14	2	19.3
Manistee county.....	26,960	24	4	14.8
Wexford county.....	17,213	17	3	17.4
NORTHERN DIVISION.....	75,614	80	16.7	22.1
Antrim county.....	14,307	6	2	14.0
Charlevoix county.....	14,126	8	2	14.1
Cheboygan county.....	16,018	36	7	43.7
Crawford county.....	3,377	3	.7	20.7
Emmet county.....	14,778	5	1	6.8
Kalkaska county.....	6,780	11	2	29.5
Otsego county.....	6,228	11	2	32.1
NORTHEASTERN DIVISION.....	57,485	103	22.2	38.6
Alcona county.....	5,594	11	3	53.6
Alpena county.....	19,160	41	8	41.8
Iosco county.....	11,316	21	4	35.3
Montmorency county.....	3,122	6	1	32.0
Ogemaw county.....	7,623	5	.8	10.5
Oscoda county.....	1,892	2	.4	21.1
Presque Isle county.....	8,778	17	5	56.9
WESTERN DIVISION.....	272,309	356	64	23.5
Kent county.....	132,753	211	36	27.1
Lake county.....	5,431	9	2	36.8
Mason county.....	19,354	19	4	20.7
Muskegon county.....	37,372	58	10	26.8
Newaygo county.....	18,788	9	2	10.6
Oceana county.....	17,392	11	3	17.2
Ottawa county.....	41,219	39	7	17.0
NORTHERN CENTRAL DIVISION.....	107,695	110	19.4	18.0
Clare county.....	8,755	9	2	22.8
Gladwin county.....	7,085	2	.4	5.6
Isabella county.....	23,244	23	3	12.9
Mecosta county.....	25,863	14	3	11.6
Midland county.....	14,239	34	5	35.1
Missaukee county.....	8,967	5	1	11.2
Osceola county.....	17,870	14	3	16.8
Roscommon county.....	1,672	9	2	119.6

*†These footnotes are below Table 42, on a preceding page.

TABLE 44.—CONCLUDED.

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
BAY AND EASTERN DIVISION.....	343,721	551	95	27.6
Arenac county.....	8,816	17	3	34.0
Bay county.....	63,224	154	26	41.1
Huron county.....	34,149	67	13	38.1
Lapeer county.....	27,836	34	5	18.0
Saginaw county.....	84,485	136	22	26.0
Sanilac county.....	34,624	38	8	23.1
St. Clair county.....	55,098	76	14	25.4
Tuscola county.....	35,489	29	4	11.3
CENTRAL DIVISION.....	315,564	271	47	14.9
Barry county.....	22,755	14	3	13.2
Clinton county.....	25,667	16	3	11.7
Eaton county.....	31,603	18	4	12.7
Genesee county.....	41,865	37	6	14.3
Gratiot county.....	29,860	13	3	10.0
Ingham county.....	42,223	54	8	18.9
Ionia county.....	34,881	17	4	11.5
Livingston county.....	19,374	17	3	15.5
Montcalm county.....	33,831	18	4	11.8
Shiawassee county.....	33,505	67	9	26.9
SOUTHWESTERN DIVISION.....	140,928	94	22	15.6
Allegan county.....	39,107	22	6	15.3
Berrien county.....	48,040	42	9	18.7
Cass county.....	20,518	13	3	14.6
Van Buren county.....	33,263	17	4	12.0
SOUTHERN CENTRAL DIVISION.....	319,011	267	41	12.8
Branch county.....	26,150	14	4	15.3
Calhoun county.....	50,995	61	8	15.7
Hillsdale county.....	29,978	23	3	10.0
Jackson county.....	46,937	41	8	17.0
Kalamazoo county.....	46,768	60	6	12.8
Lenawee county.....	48,888	33	6	12.3
St. Joseph county.....	24,024	8	1	4.2
Washtenaw county.....	45,271	27	5	11.0
SOUTHEASTERN DIVISION.....	459,215	1,036	210	45.7
Macomb county.....	32,798	47	10	30.5
Monroe county.....	33,101	51	10	30.2
Oakland county.....	44,463	38	7	15.7
Wayne county.....	348,853	900	183	52.5

*†These footnotes are below Table 42, on a preceding page.

THE PREVALENCE OF DIPHTHERIA IN URBAN AND RURAL LOCALITIES.

Table 45 indicates that, in 1909, with the exception of groups two and five, diphtheria was most prevalent in the large centers of population, and the least prevalent in the rural localities.

By Table 45A, it may be seen that, in 1909, the urban localities which showed much higher death rates from diphtheria than the death rate for this disease for the entire State for that year were: Alpena, Calumet township, Charlotte, Detroit, Houghton, Iron Mountain, Ironwood, Ishpeming, Lansing, Laurium, Negaunee, Niles, Owosso, Pontiac, Sault Ste. Marie and Wyandotte.

The localities, shown in Table 45A, in which the death rates were much lower in 1909 than the rate for the entire State for that year were: Battle Creek, Flint, Grand Rapids, Kalamazoo and Saginaw.

The localities, shown in Table 45A, which showed much higher death rates from diphtheria in 1909 than the average for such localities in the years 1904-1908, were: Alpena, Ann Arbor, Charlotte, Houghton, Iron Mountain, Ironwood, Ishpeming, Lansing, Laurium, Negaunee, Niles, Owosso, Pontiac, St. Joseph and Sault Ste. Marie.

The localities, shown in Table 45A, which showed much lower death rates from diphtheria in 1909 than the average for such localities in the years 1904-1908, were: Battle Creek, Bay City, Cadillac, Flint, Grand Rapids, Hancock, Jackson, Kalamazoo, Mt. Clemens, Saginaw and Ypsilanti.

As shown in Table 45A, there were no deaths from diphtheria in 1909 in Adrian, Albion, Benton Harbor, Big Rapids, Coldwater, Grand Haven, Hillsdale, Holland, Ionia, Ludington, Manistee, Manistique, Menominee, Monroe, Mt. Pleasant, Muskegon, Norway, Petoskey, Port Huron and Traverse City.

TABLE 45.—*The prevalence of diphtheria in urban and rural localities, in Michigan, in 1909.*

Localities—Grouped according to density of population.	Population.*	Health jurisdictions.			Cases.†	Deaths.	Death rates per 100,000 of the population.
		Total.	Infected.				
			Number.	Per cent of all jurisdictions.			
Cities over 50,000.....	524,498	3	3	100	1,190	125	23.8
Cities from 25,000 to 50,000.....	154,255	5	5	100	232	18	11.7
Cities from 10,000 to 25,000 and Calumet township (18,628).....	222,289	16	15	94	299	45	20.2
Cities and villages from 5,000 to 10,000.....	185,982	28	23	82	364	46	24.7
Cities and villages under 5,000‡.....	352,905	325	73	22	291	36	10.2
Total urban.....	1,439,929	377	119	32	2,376	270	18.8
Balance of localities—principally townships§....	1,226,380	1,284	238	19	733	127	10.4

*†These footnotes are below Table 42, on a preceding page.

‡Exclusive of 57 cities and villages, for which the population in 1909 cannot be correctly estimated.

§Includes the 57 cities and villages mentioned in the preceding paragraph, but does not include Calumet township, which, for the purpose of this study, is included in the third group of urban localities, which have corresponding populations.

TABLE 45A.—*The prevalence of diphtheria in 1909, and preceding years, in each of the principal localities included in the first four groups in Table 45.*

Localities.	1909.				Average, 1904-1908.			
	Popula- tion.*	Cases.	Deaths.	Deaths per 100,000 inhab- itants.	Popula- tion,*	Cases.	Deaths.	Deaths per 100,000 inhab- itants.
Adrian.....	11,963	0	0	.....	11,193	†16	2	17.9
Albion.....	5,473	0	0	.....	5,155	2	0	.....
Alpena.....	13,148	15	6	45.6	12,699	†4	3	23.6
Ann Arbor.....	14,712	5	2	13.6	14,643	9	.6	4.1
Battle Creek.....	26,776	38	2	7.5	24,038	55	4	16.6
Bay City.....	40,509	82	5	12.3	37,989	‡30	7	18.4
Benton Harbor.....	6,877	0	0	.....	6,772	10	.8	11.8
Big Rapids.....	5,060	0	0	.....	4,935	12	2	40.5
Cadillac.....	8,013	4	1	12.5	7,341	11	2	27.2
Calumet township.....	18,628	67	6	32.2	17,813	19	5	28.1
Charlotte.....	5,519	13	2	36.2	5,043	2	.2	4.0
Cheboygan.....	7,032	1	1	14.2	6,851	†3	.8	11.7
Coldwater.....	6,237	1	0	.....	6,230	1	.2	3.2
Detroit.....	366,646	1,018	111	30.3	338,435	†798	97	28.7
Escanaba.....	13,035	29	2	15.3	11,873	17	2	16.8
Flint.....	17,111	8	1	5.8	15,775	17	3	19.0
Grand Haven.....	5,859	1	0	.....	5,487	2	0	.....
Grand Rapids.....	105,910	116	10	9.4	99,795	285	28	28.1
Hancock.....	8,521	1	1	11.7	7,030	§1	2	28.4
Hillsdale.....	5,632	0	0	.....	5,138	.2	0	.....
Holland.....	10,436	16	0	.....	9,554	6	1	10.5
Houghton.....	5,581	||	2	35.8	4,839	.6	.4	8.3
Ionia.....	5,239	0	0	.....	5,229	2	.2	3.8
Iron Mountain.....	7,764	29	15	193.2	8,256	8	2	24.2
Ironwood.....	10,412	||	17	163.3	10,176	||	6	59.0
Ishpeming.....	9,583	144	11	114.8	10,807	53	6	55.5
Jackson.....	25,450	46	3	11.8	25,360	40	6	23.7
Kalamazoo.....	36,505	23	2	5.5	32,471	57	4	12.3
Lansing.....	25,015	43	6	24.0	22,172	22	3	13.5
Laurium.....	10,166	||	2	19.7	8,658	.4	.2	2.3
Ludington.....	7,376	11	0	.....	7,306	16	3	41.1
Manistee.....	10,768	10	0	.....	11,932	18	3	25.1
Manistique.....	5,184	16	0	.....	4,831	15	1	20.7
Marquette.....	11,424	9	2	17.5	10,969	16	2	18.2
Menominee.....	8,944	1	0	.....	10,235	4	1	9.8
Monroe.....	7,485	7	0	.....	6,671	18	2	30.0
Mt. Clemens.....	7,773	1	1	12.9	7,374	19	3	40.7
Mt. Pleasant.....	5,512	5	0	.....	4,895	25	1	20.4
Muskegon.....	20,995	2	0	.....	20,937	33	4	19.1
Negaunee.....	6,625	69	4	60.3	6,728	11	1	14.9
Niles.....	5,084	1	1	19.7	4,819	.8	0	.....
Norway.....	5,732	4	0	.....	5,211	13	1	19.2
Owosso.....	9,707	||	3	30.9	9,370	†6	.4	4.3
Petoskey.....	5,062	2	0	.....	5,136	5	.2	3.9
Pontiac.....	12,278	86	4	32.6	11,442	||	2	17.5
Port Huron.....	21,116	7	0	.....	20,463	44	5	24.4
Saginaw.....	51,942	56	4	7.7	48,743	103	11	22.6
St. Joseph.....	5,531	2	1	18.1	5,406	2	.4	7.4
Sault Ste. Marie.....	12,572	13	3	23.9	11,894	9	2	16.8
Traverse City.....	13,525	13	0	.....	12,152	14	.6	4.9
Wyandotte.....	5,728	31	2	34.9	5,546	†5	2	36.1
Ypsilanti.....	7,849	15	1	12.7	7,692	†11	2	26.0

*Estimated for intercensal years.

†Average for four years.

‡Does not include West Bay City for 1904, which was consolidated with Bay City in 1905.

§Average for three years.

||Fatal cases only reported.

¶Average for two years.

REPORTED SOURCES OF CONTAGIUM IN DIPHTHERIA.

Table 46 indicates that the two principal ways in which diphtheria is spread are:

1. By infection from a recent previous case in the same household or locality.

2. By infection from outside health jurisdictions.

The fact that, in the years 1906-1909, over 48 per cent of the cases of diphtheria in which a source was given, were due to infection from outside jurisdictions, is a striking example of the lack of, or imperfection, in many instances, of the local efforts for the restriction of the disease.

Were all cases of diphtheria promptly and properly isolated, and the isolation continued until the danger of infecting others was at an end, the spread of the disease from one locality to another would be a rare occurrence.

The places from which and to which diphtheria was spread in 1909 are shown in Table 47.

In the past, very many cases of diphtheria have been reported as due to exposure to persons suffering from sore throat, and other throat troubles, which, in reality, were cases of diphtheria, of a more or less mild character.

Another, and what is generally believed to be a fruitful source of contagium in outbreaks of diphtheria, is the contact of well persons with those recently recovered from the disease, but in the throats of whom the bacilli are still present.

TABLE 46.—*The reported sources of contagium in diphtheria, in Michigan, in the four years 1906-1909, as indicated by the number and per cent of instances in which each of the given sources was responsible for the introduction of the disease into a household.*

Sources.	Number of instances.	Per cent of all instances in which a source was given.
Traced to a former case in same locality.....	297	48.4
Outside jurisdictions.....	296	48.2
Infected premises, clothing, etc.....	11	1.8
Insanitary conditions.....	7	1.1
Infected by animals.....	2	.3
Contaminated water.....	1	.2
Not stated or statements doubtful.....	9,233	*93.8

*Per cent of all households in which diphtheria occurred.

TABLE 47.—*The localities from which and to which diphtheria was spread during the year 1909.*

Spread from:	To:	Spread from:	To:
Alpena county, Alpena city.	Montmorency county, Briley township.	Marquette county, Forsyth township.	Marquette county, Richmond township.
Arenac county, Twining village.	Iosco county, Burleigh township.	Marquette county, Negaunee city.	Marquette county, Humboldt township.
Bay county, Bay City city.	Bay county, Finconning village.	Menominee county, Menominee city.	Menominee county, Stephenson township.
Bay county, Bay City city.	Tuscola county, Akron township.	Oakland county, Pontiac city.	Oakland county, Waterford township.
Cass county, Dowagiac city.	Van Buren county, Hamilton township.	Oakland county, Rose township.	Oakland county, Holly township.
Clinton county, Du Plain township.	Shiawassee county, Fairfield township.	Oscoda county, Marion village.	Wexford county, Clam Lake township.
Genesee county, Flint city.	Clinton county, Elsie village.	Saginaw county, Saginaw city.	Saginaw county, Blumfield township.
Kent county, Grand Rapids city.	Van Buren county, Antwerp township.	Tuscola county, Akron township.	Tuscola county, Caro village.
Macomb county, Armada township.	Macomb county, Bruce township.	Washtenaw county, Ann Arbor city.	Macomb county, New Baltimore village.
Marquette county, Ely township.	Marquette county, Champion township.	Wayne county, Detroit city.	Macomb county, Warren village.

TABLE 47.—CONCLUDED.

FROM OUTSIDE THE STATE TO LOCALITIES IN MICHIGAN.		Spread from:	To:
Spread from:	To:		
Canada, (No locality given).	Shiawassee county, Durand village.	Minnesota, (No locality given).	Gogebic county, Bessemer city.
Idaho, (No locality given).	Missaukee county, Richland township.	Minnesota, Two Harbors.	Ontonagon county, Ontonagon village.
Illinois, Chicago.	Clinton county, De Witt township.	New York, New York City.	Macomb county, Armada township.
Illinois, Chicago.	Mason county, Hamlin township.	Ohio, Elyria.	Lenawee county, Adrian township.
Illinois, Chicago.	Ottawa county, Holland city.	Ohio, (No locality given).	Monroe county, Raisinville township.
Minnesota, Duluth.	Midland county, Porter township.	Wisconsin, Hurley.	Gogebic county, Bessemer city.

RESTRICTIVE AND PREVENTIVE MEASURES IN DIPHTHERIA.

By reference to Table 48, it may be seen that, of the total number of reports in which a definite statement was made relative to the restrictive and preventive measures of isolation and disinfection in households in which diphtheria occurred, in the four years 1906-1909, 89 per cent of the reports showed the above measures had been enforced. One gratifying result of these restrictive and preventive measures is shown in the table, viz., that in 82 per cent of the households the disease was restricted to the first case.

It is believed that a very much better showing could be made relative to the results of restrictive measures in diphtheria, as shown by Tables 48 to 51, if, in every case, the isolation of the patient was continued, even after apparent complete recovery, until it was determined by repeated bacteriological tests, that the throat of such person was free from diphtheria bacillus. This applies, with equal force, to those persons who have been thoroughly exposed to the disease.

In the pamphlet on the "Restriction and Prevention of Diphtheria," published by this Department, the statement is made that all persons recovering, or recently recovered, from diphtheria should be considered dangerous; therefore such a person should not be permitted to associate with others, or to attend school, church or any other public assembly until the throat and any sores which may have been on the lips or nose are healed, nor until two negative cultures have been made of the throat. As soon as the throat has cleaned up, make cultures two or three days apart, and as soon as they show negative twice the patient can be disinfected and allowed to go. The bacillus, which is the specific cause of diphtheria, has been found in the throat weeks after apparent complete recovery from the disease, and unless cultures of the throat have been made, the patient should remain in isolation for two weeks after apparent complete recovery.

The difficulty in having bacteriological tests made, in the past, except in the cases of three or four of the large cities, is now overcome, as the State Laboratory is in a position to take care of these tests, and no further trouble should be experienced in determining the proper time at which to raise the quarantine in cases of diphtheria.

TABLE 48.—*Restrictive and preventive measures in diphtheria, in Michigan, in the four years, 1906-1909.*

Restrictive and preventive measures.	Number of households.	Per cent.
PLACARDING, ISOLATION AND DISINFECTION:		
Enforced.....	8,160	89
Neglected.....	382	4
Not stated or statements doubtful.....	651	7
Instances in which the disease was restricted to the first case in a household.....	7,499	82

The showing made in the years, 1906-1909, in those instances in which the restrictive and preventive measures of placarding, isolation and disinfection, were enforced, (see Table 49), is encouraging, particularly in the case of the average number of deaths per household.

TABLE 49.—*Showing the total number of households in which diphtheria was present during the four years, 1906-1909; and the total and average number of cases and deaths in each household in which the restrictive measures were enforced or neglected.*

	Total number of households, 9,193.		Restrictive measures enforced in 8,160 households.		Restrictive measures neglected in 382 households.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals.....	12,350	1,565	10,759	1,177	648	137
Average number per household.....	1.34	.17	1.32	.14	1.70	.36

By Table 50, it may be seen that, in the years, 1906-1909, the fatality (deaths per 100 cases) from diphtheria in those households in which the antitoxin treatment was used was fifty-two per cent less than in those households where it was not used.

The decrease in the death rate from diphtheria since 1894, when the general use of antitoxin began, may be seen by reference to Table 42, on a preceding page. It will be noted that, in 1908, the deaths per 100,000 of the population were smaller than at any time since the disease has been studied by this Department.

TABLE 50.—*The antitoxin treatment of persons sick from diphtheria, in Michigan, in the four years, 1906-1909.*

	Number of households.	Number of cases.	Number of deaths.	Deaths per 100 cases.
All outbreaks of diphtheria.	9,193	12,350	1,565	12.7
Outbreaks in which antitoxin was administered to each sick person in a household*.	4,550	6,223	659	10.6
Outbreaks in which antitoxin was not administered to the sick.	478	682	151	22.1

*There were also 278 households in which 948 cases and 127 deaths occurred, but in which only a portion of the sick persons were treated with antitoxin, and as the reports did not show how many of the 127 fatal cases were included in the 508 cases treated, the 278 households, and the cases and deaths which occurred in them, could not be used in making comparison relative to the fatality from diphtheria in households in which antitoxin was and was not used.

The immunizing properties of antitoxin is strikingly shown by Table 51. It should be stated, however, that of those exposed persons treated with antitoxin, and who subsequently developed diphtheria, many had the disease in a very mild form.

TABLE 51.—*The number and per cent of persons exposed to diphtheria, who were treated with antitoxin, and who were subsequently taken sick with the disease, in each of the years, 1902-1909.*

Years.	Exposed persons treated with antitoxin.		
	Number.	Taken sick.	Per cent.
1902.	495	16	3.23
1903.	585	12	2.05
1904.	612	24	3.92
1905.	1,312	50	3.81
1906.	2,190	61	2.79
1907.	1,896	83	4.38
1908.	1,209	37	3.06
1909.	1,434	45	2.14
Average.	1,217	41	3.37

WHOOPIING-COUGH IN MICHIGAN IN 1909 AND PRECEDING YEARS.

GENERAL PREVALENCE.

During the year ending December 31, 1909, whooping-cough was reported present in 672 households, with a total of 1,054 cases, including 213 deaths. As the health officers of many localities did not report the non-fatal cases of whooping-cough which occurred in their localities, it is impossible to determine, with any degree of accuracy, the total number of households infected or the number of cases that occurred in such households.

In 1909, compared with the preceding year, there was a small decrease in the number of reported cases of whooping-cough, and the death rate per 100,000 inhabitants was slightly lower.

In 1909, compared with the average for the twenty-three years, 1886-1908, the number of reported cases of whooping-cough was 66 per cent less, while the death rate per 100,000 inhabitants was 23 per cent greater.

In 1909 the fatality rate (deaths per 100 cases) for whooping-cough was about four times greater than the average for the twenty-three years preceding.

In studying the fatality rates from whooping-cough, particularly in recent years, the fact should be borne in mind that, prior to 1898, not all deaths were reported; and that while the deaths from whooping-cough are now fully reported, a large number of cases are not reported, making the fatality in recent years much too high.

Table 53 gives the deaths rates for whooping-cough, as compiled by the Secretary of State, prior to the commencement of the compilation of this disease by the State Health Department. Comparing the death rates prior to 1886 with those since that time, it will be seen that, as a rule, those of the former period were much greater, probably due to the different methods in use in the two departments in the classification of deaths from whooping-cough when complicated with or followed by other diseases induced by it.

GEOGRAPHICAL DISTRIBUTION OF WHOOPING-COUGH.

Table 54 indicates that in the twelve years, 1898-1909, compared with the average death rate for the entire State for the same period (9.0 per 100,000 inhabitants), whooping-cough was much more prevalent than the average in the Upper Peninsular and Northern Divisions, and slightly more prevalent than the average in the Northeastern, Northern Central and Southeastern Divisions.

The counties in which whooping-cough was unusually prevalent during the twelve years, 1898-1909, placed in the order of highest death rates, are: Alger, Roscommon, Houghton, Cheboygan, Dickinson, Menominee, Marquette, Alpena, Delta, Otsego, Bay, Chippewa, Midland, Baraga, Antrim, Charlevoix, Kalkaska, Macomb, Gladwin, Gogebie, Emmet, Ogemaw, Iron and Montmorency.

TABLE 52.—*The general prevalence of whooping-cough, in Michigan, during the twenty-four years, 1886-1909.*

Years.	Population.*	Reported cases.†	Reported deaths.	Deaths per 100 cases.‡	Deaths per 100,000 of the population.
1886.....	1,933,735	2,642	62	2.3	3.2
1887.....	1,973,774	2,267	59	2.6	3.0
1888.....	2,013,812	2,502	49	2.0	2.4
1889.....	2,053,851	2,694	41	1.5	2.0
1890.....	2,093,889	983	20	2.0	1.0
1891.....	2,130,827	2,360	101	4.3	4.7
1892.....	2,167,765	3,188	77	2.4	3.6
1893.....	2,204,703	4,047	134	3.3	6.1
1894.....	2,241,641	4,555	123	2.7	5.5
1895.....	2,271,531	4,284	109	2.5	4.8
1896.....	2,301,421	5,466	91	1.7	4.0
1897.....	2,331,311	3,978	72	1.8	3.1
1898.....	2,361,201	5,300	267	5.0	11.3
1899.....	2,391,091	6,509	216	3.3	9.0
1900.....	2,420,982	3,397	177	5.2	7.3
1901.....	2,450,872	2,955	118	4.0	4.8
1902.....	2,475,499	3,534	222	6.3	8.9
1903.....	2,502,758	4,172	361	8.7	14.4
1904.....	2,530,016	1,779	141	7.9	5.6
1905.....	2,557,275	1,196	119	9.9	4.7
1906.....	2,584,533	1,364	392	28.7	15.2
1907.....	2,611,792	872	214	24.5	8.2
1908.....	2,639,050	1,248	283	22.7	10.8
1909.....	2,666,309	1,054	213	20.2	8.0
Averages per year.....	2,329,568	3,014	153	5.1	6.5

*Estimated for intercensal years.

†From many localities only the fatal cases were reported during many of the years.

‡For the reason that, in many instances, only the fatal cases were reported, these fatality rates are inaccurate.

TABLE 53.—*The number of deaths from whooping-cough, in Michigan, per 100,000 persons living, in each of the seventeen years, 1869-1885. Compiled from the Secretary of State's Vital Statistics of Michigan.*

Years.....	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
Deaths.....	13.9	10.1	5.5	15.1	15.6	11.2	7.2	12.4	8.7	8.5	10.2
Years.....	1880.	1881.	1882.	1883.	1884.	1885.	Average 1869-1885.				
Deaths.....	16.1	8.4	5.0	5.2	8.8	7.4	10.0				

TABLE 54.—*The geographical distribution of whooping-cough, in Michigan, in the twelve years, 1898-1909, as indicated by the average number of cases and deaths, and the average deaths per 100,000 persons living, in each geographical division shown in the table.*

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
UPPER PENINSULAR DIVISION.....	270,717	563	40.2	14.8
Alger county.....	6,374	8	2	31.4
Baraga county.....	5,265	1	.7	13.3
Chippewa county.....	21,693	86	3	13.8
Delta county.....	26,804	62	4	14.9
Dickinson county.....	18,479	17	3	16.2
Gogebic county.....	16,992	23	2	11.8
Houghton county.....	68,340	138	12	17.6
Iron county.....	8,775	12	1	11.4
Keweenaw county.....	4,352	2	.2	4.6
Luce county.....	3,700	3	.3	8.1
Mackinac county.....	8,024	5	.4	5.0
Marquette county.....	39,910	114	6	15.0
Menominee county.....	26,176	30	4	15.3
Ontonagon county.....	7,133	6	.7	9.8
Schoolcraft county.....	8,700	56	.9	10.3
NORTHWESTERN DIVISION.....	91,611	78	6.8	7.4
Benzie county.....	10,981	6	.8	7.3
Grand Traverse county.....	23,318	29	2	8.6
Leelanau county.....	10,911	4	1	9.2
Manistee county.....	27,279	30	2	7.3
Wexford county.....	19,122	9	1	5.2
NORTHERN DIVISION.....	83,954	108	11.2	13.3
Antrim county.....	15,400	29	2	13.0
Charlevoix county.....	15,903	10	2	12.6
Cheboygan county.....	17,237	14	3	17.4
Crawford county.....	3,706	4	.3	8.1
Emmet county.....	17,248	26	2	11.6
Kalkaska county.....	7,420	11	.9	12.1
Otsego county.....	7,040	14	1	14.2
NORTHEASTERN DIVISION.....	60,560	71	6.48	10.7
Alcona county.....	5,641	1	.08	1.4
Alpena county.....	19,966	17	3	15.0
Iosco county.....	10,330	9	1	9.7
Montmorency county.....	3,543	12	.4	11.3
Ogemaw county.....	8,692	27	1	11.5
Oscoda county.....	1,900	2	0	.....
Presque Isle county.....	10,488	3	1	9.5
WESTERN DIVISION.....	279,516	248	17	6.1
Kent county.....	138,897	146	6	4.3
Lake county.....	5,039	5	0	.....
Mason county.....	19,868	21	2	10.0
Muskegon county.....	36,896	18	3	8.1
Newaygo county.....	18,363	13	2	10.8
Oceana county.....	17,811	19	1	5.6
Ottawa county.....	42,642	26	3	7.0
NORTHERN CENTRAL DIVISION.....	107,635	181	10.1	9.4
Clare county.....	9,152	18	.8	8.7
Gladwin county.....	8,326	16	1	12.0
Isabella county.....	24,297	27	2	8.2
Mecosta county.....	20,445	29	2	9.8
Midland county.....	14,901	54	2	13.4
Missaukee county.....	10,172	13	1	9.8
Osceola county.....	18,700	19	.9	4.8
Roscommon county.....	1,642	5	.4	24.4

*†These footnotes are below Table 52, on a preceding page.

TABLE 54.—CONCLUDED.

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
BAY AND EASTERN DIVISION.....	348,517	297	31	8.9
Arenac county.....	9,918	7	1	10.0
Bay county.....	64,120	49	9	14.0
Huron county.....	35,274	57	3	8.5
Lapeer county.....	27,231	33	2	7.3
Saginaw county.....	85,417	36	5	5.9
Sanilac county.....	34,948	47	3	8.6
St. Clair county.....	55,542	38	5	9.0
Tuscola county.....	36,067	30	3	8.3
CENTRAL DIVISION.....	316,847	486	21.7	6.8
Barry county.....	22,237	71	1	4.5
Clinton county.....	25,345	28	2	7.9
Eaton county.....	31,023	124	2	6.4
Genesee county.....	42,696	22	3	7.0
Gratiot county.....	30,330	20	3	9.9
Ingham county.....	43,728	38	2	4.6
Ionia county.....	35,069	67	2	3.7
Livingston county.....	18,762	40	.7	
Montcalm county.....	33,748	39	4	11.9
Shiawassee county.....	33,909	37	2	5.9
SOUTHWESTERN DIVISION.....	143,410	158	12	8.4
Allegan county.....	39,045	34	3	7.7
Berrien county.....	49,603	56	5	10.0
Cass county.....	20,175	25	1	4.9
Van Buren county.....	34,587	43	3	8.7
SOUTHERN CENTRAL DIVISION.....	324,759	407	19.8	6.1
Branch county.....	26,109	34	2	7.7
Calhoun county.....	53,172	80	4	7.5
Hillsdale county.....	29,834	46	1	3.4
Jackson county.....	47,192	74	4	8.5
Kalamazoo county.....	49,567	68	4	8.1
Lenawee county.....	49,094	43	2	4.0
St. Joseph county.....	23,419	21	.8	3.4
Washtenaw county.....	46,372	41	2	4.3
SOUTHEASTERN DIVISION.....	493,500	186	49	9.9
Macomb county.....	33,069	33	4	12.1
Monroe county.....	33,140	43	3	9.1
Oakland county.....	45,602	27	2	4.4
Wayne county.....	381,689	83	40	10.5

*†These footnotes are below Table 52, on a preceding page.

REPORTED SOURCES OF CONTAGIUM IN WHOOPING-COUGH.

Of the total number of reports of whooping-cough in the four years, 1906-1909, only eleven per cent gave a definite source of contagium. .

As shown in Table 55, in the four years, 1906-1909, 61 per cent of the outbreaks, in which a source was given, were traced to former cases in the same localities, and 39 per cent were traced to outside jurisdictions.

The places from which and to which whooping-cough was spread in 1909 are shown in Table 56.

TABLE 55.—*The reported sources of contagium in whooping-cough, in Michigan, in the four years, 1906-1909, as indicated by the number and per cent of instances in which each of the given sources was responsible for the introduction of the disease into a household.*

Sources.	Number of instances.	Per cent of all instances in which a source was given.
Traced to former cases in same locality	185	61.1
Outside jurisdictions	118	38.9
Not stated or statements doubtful	2,437	*88.9

*Per cent of all households in which whooping-cough occurred.

TABLE 56.—*The localities from which and to which whooping-cough was spread during the year 1909.*

Spread from:	To:	Spread from:	To:
Barry county, Hastings city.	Barry county, Maple Grove township.	Kent county, Grand Rapids city.	Mason county, Marquette township.
Barry county, Nashville village.	Barry county, Maple Grove township.	Lenawee county, Ogden township.	Lenawee county, Fairfield township.
Berrien county, Benton Harbor city.	Berrien county, Weesaw township.	Mecosta county, Barryton village.	Mecosta county, Sheridan township.
Cass county, Volinia township.	Cass county, Penn township.	Presque Isle county, North Allis township.	Presque Isle county, Case township.
Clinton county, Elsie village.	Shiawassee county, Fairfield township.	Shiawassee county, Byron village.	Livingston county, Cohoctah township.
Jackson county, Jackson city.	Clinton county, De Witt township.	Wayne county, Detroit city.	Sanilac county, Forester township.
Jackson county, Parma village.	Hillsdale county, Somerset township.	FROM OUTSIDE THE STATE TO LOCALITIES IN MICHIGAN.	
Kalamazoo county, Kalamazoo city.	Barry county, Prairieville township.	Illinois, Chicago.	Jackson county, Brooklyn village.
Kalamazoo county, Kalamazoo city.	Berrien county, Watervliet village.	Ohio, (No locality given).	Hillsdale county, Ransom township.
Kalkaska county, Kalkaska village.	Kalkaska county, Sage township.	Ohio, (No locality given).	Hillsdale county, Wright township.

RESTRICTIVE AND PREVENTIVE MEASURES IN WHOOPING-COUGH.

Table 57 indicates that in but 18 per cent of the outbreaks in whooping-cough in the four years, 1906-1909, was there any attempt made to restrict the disease, and this condition will continue until the dangerous character of this disease is fully and universally recognized.

TABLE 57.—*Restrictive and preventive measures in whooping-cough, in Michigan, in the four years, 1906-1909.*

Restrictive and preventive measures.	Number of households.	Per cent.
PLACARDING, ISOLATION AND DISINFECTION:		
Enforced.....	479	17.5
Neglected.....	1,195	43.6
Not stated or statements doubtful.....	1,066	38.9

SCARLET FEVER IN MICHIGAN IN 1909 AND PRECEDING YEARS.

GENERAL PREVALENCE.

During the year 1909, scarlet fever was reported present in 3,658 households in this State, with an aggregate of 5,153 cases, including 268 deaths.

In 1909, compared with the previous year, there were 1,512 more households infected and there occurred 2,066 cases and 77 deaths more.

In 1909, compared with the average for the twenty-five years, 1884-1908 (9.7 deaths per 100,000 population), the number of cases and deaths and the death rate per 100,000 of the population, were considerably more, while the fatality (deaths per 100 cases) was slightly less.

A comparison of the death rates in Tables 58 and 59 shows that, from 1870 to 1883, inclusive, the average death rate from scarlet fever was much higher than in any year since that time, the highest rates being in the years prior to the establishment of the State Board of Health.

TABLE 58.—*The prevalence of scarlet fever, in Michigan, during the twenty-six years, 1884-1909.*

Years.	Population.*	Reported cases.	Reported deaths.	Deaths per 100 cases.	Deaths per 100,000 of the population.
1884.....	1,853,658	2,476	230	9.3	12.4
1885.....	1,893,697	2,750	187	6.8	9.9
1886.....	1,933,735	3,046	275	9.0	14.2
1887.....	1,973,774	3,400	314	9.2	15.9
1888.....	2,013,812	2,989	200	6.7	9.9
1889.....	2,053,851	3,535	166	4.7	8.1
1890.....	2,093,889	3,835	162	4.2	7.7
1891.....	2,130,827	6,212	286	4.6	13.4
1892.....	2,167,765	7,075	487	6.9	22.5
1893.....	2,204,703	6,065	415	6.8	18.8
1894.....	2,241,641	5,500	203	3.7	9.1
1895.....	2,271,531	3,908	125	3.2	5.5
1896.....	2,301,421	2,646	81	3.1	3.5
1897.....	2,331,311	2,482	115	4.6	4.9
1898.....	2,361,201	2,409	100	4.2	4.2
1899.....	2,391,091	4,345	171	3.9	7.2
1900.....	2,420,982	6,734	306	4.5	12.6
1901.....	2,450,872	7,726	298	3.9	12.2
1902.....	2,475,499	6,582	248	3.8	10.0
1903.....	2,502,758	5,353	212	4.0	8.5
1904.....	2,530,016	4,088	228	5.6	9.0
1905.....	2,557,275	2,286	125	5.5	4.9
1906.....	2,584,533	3,066	255	7.3	8.7
1907.....	2,611,792	2,514	167	6.6	6.4
1908.....	2,639,050	3,087	191	6.2	7.2
1909.....	2,666,309	5,153	268	5.2	10.1
Averages per year.....	2,294,500	4,202	228	5.4	9.9

*Estimated for intercensal years.

TABLE 59.—*The number of deaths from scarlet fever, in Michigan, per 100,000 persons living in each of the fifteen years, 1869-1883. Compiled from the Secretary of State's Vital Statistics of Michigan.*

Years.....	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
Deaths.....	22.1	72.0	56.6	44.3	43.9	32.2	30.0	27.4	26.9	27.7	26.3
Years.....	1880.	1881.	1882.	1883.	Average, 1869-1883.						
Deaths.....	22.7	22.8	34.3	37.9	35.1						

GEOGRAPHICAL DISTRIBUTION OF SCARLET FEVER.

Table 60 indicates that, compared with the average for the entire State for the eighteen years, 1892-1909, (9.1 deaths per 100,000 inhabitants), scarlet fever was much more prevalent than the average in the Upper Peninsular and Southeastern Divisions.

The counties in which scarlet fever was unusually prevalent in the eighteen years, 1892-1909, as compared with the average for the entire State for that period, placed in the order of greatest death rates, are:

Gogebic.....	with a death rate of 30.8 per 100,000
Houghton.....	" " " " 29.7 " "
Mackinac.....	" " " " 25.6 " "
Missaukee.....	" " " " 21.8 " "
Oscoda.....	" " " " 21.2 " "
Keweenaw.....	" " " " 21.0 " "
Lake.....	" " " " 18.7 " "
Wexford.....	" " " " 17.1 " "
Wayne.....	" " " " 17.0 " "
Otsego.....	" " " " 15.8 " "
Alpena.....	" " " " 15.5 " "
Chippewa.....	" " " " 15.2 " "
Marquette.....	" " " " 15.2 " "
Macomb.....	" " " " 14.7 " "
Ontonagon.....	" " " " 14.7 " "
Crawford.....	" " " " 13.8 " "
Antrim.....	" " " " 12.5 " "
Montmorency.....	" " " " 12.3 " "
Cheboygan.....	" " " " 12.1 " "
Schoolcraft.....	" " " " 11.5 " "
Dickinson.....	" " " " 11.5 " "

TABLE 60.—*The geographical distribution of scarlet fever, in Michigan, in the eighteen years, 1892-1909, as indicated by the average number of cases and deaths, and the average deaths per 100,000 persons living, in each geographical division shown in the table.*

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
UPPER PENINSULAR DIVISION.....	251,200	569	43.9	17.5
Alger county.....	5,225	6	.2	3.8
Baraga county.....	4,951	2	0	
Chippewa county.....	19,690	34	3	15.2
Delta county.....	24,439	38	2	8.2
Dickinson county.....	17,406	32	2	11.5
Gogebic county.....	16,237	40	5	30.8
Houghton county.....	60,548	179	18	29.7
Iroh county.....	7,776	14	.7	9.0
Keweenaw county.....	3,811	6	.8	21.0
Luce county.....	3,275	1	.2	6.1
Mackinac county.....	7,808	13	2	25.6
Marquette county.....	39,587	151	6	15.2
Menominee county.....	25,392	26	2	7.9
Ontonagon county.....	6,806	14	1	14.7
Schoolcraft county.....	8,249	13	1	12.1
NORTHWESTERN DIVISION.....	86,599	172	8.3	9.7
Benzie county.....	10,067	30	1	9.9
Grand Traverse county.....	21,496	51	2	9.3
Leelanau county.....	10,472	8	.3	2.9
Manistee county.....	27,046	45	2	7.4
Wexford county.....	17,518	38	3	17.1
NORTHERN DIVISION.....	76,727	149	7.9	10.3
Antrim county.....	14,494	27	2	13.8
Charlevoix county.....	14,347	30	.9	6.3
Cheboygan county.....	16,212	29	2	12.3
Crawford county.....	3,391	8	.5	14.7
Emmet county.....	15,101	26	.8	5.3
Kalkaska county.....	6,858	18	.7	10.2
Otsego county.....	6,324	11	1	15.8
NORTHEASTERN DIVISION.....	57,766	* 92	6.2	10.8
Alcona county.....	5,592	9	.4	7.2
Alpena county.....	19,321	26	3	15.5
Iosco county.....	11,053	18	1	9.0
Montmorency county.....	3,204	11	.4	12.5
Ogemaw county.....	7,716	19	.6	7.8
Oscoda county.....	1,883	4	.4	21.2
Presque Isle county.....	8,997	5	.4	4.4
WESTERN DIVISION.....	273,462	590	18.7	6.8
Kent county.....	133,817	352	10	7.5
Lake county.....	5,353	18	1	18.7
Mason county.....	19,484	22	2	10.3
Muskegon county.....	37,150	82	2	5.4
Newaygo county.....	18,662	21	.9	4.8
Oceana county.....	17,464	25	.8	4.6
Ottawa county.....	41,532	70	2	4.8
NORTHERN CENTRAL DIVISION.....	103,363	154.3	6.86	6.6
Clare county.....	8,803	8	.7	8.0
Gladwin county.....	7,228	9	.7	9.7
Isabella county.....	23,455	36	.7	2.1
Mecosta county.....	20,618	31	1	4.9
Midland county.....	14,417	22	.7	4.9
Missaukee county.....	9,165	20	2	21.8
Osceola county.....	18,029	28	1	5.5
Roscommon county.....	1,648	.3	.06	3.6

*†These footnotes are below Table 58, on a preceding page.

TABLE 60.—CONCLUDED.

Geographical Divisions.	Average.			
	Population.*	Cases.†	Deaths.	Death rates.
BAY AND EASTERN DIVISION.....	344,666	563	25.7	7.5
Arenac county.....	8,974	13	.7	7.8
Bay county.....	63,485	136	7	11.0
Huron county.....	34,413	42	3	8.7
Lapeer county.....	27,765	53	1	3.6
Saginaw county.....	84,479	102	5	5.9
Sanilac county.....	34,762	34	2	5.8
St. Clair county.....	55,231	124	5	9.1
Tuscola county.....	35,617	59	2	5.6
CENTRAL DIVISION.....	316,076	554	15.2	4.8
Barry county.....	22,706	24	.7	3.1
Clinton county.....	25,630	51	2	7.8
Eaton county.....	51,571	54	1	3.2
Genesee county.....	42,000	100	2	4.8
Gratiot county.....	29,888	39	1	3.3
Ingham county.....	42,454	69	2	4.7
Ionia county.....	35,002	77	2	5.7
Livingston county.....	19,299	30	.5	2.6
Montcalm county.....	33,900	55	2	5.9
Shiawassee county.....	33,626	55	2	5.9
SOUTHWESTERN DIVISION.....	141,416	220	8.8	6.2
Allegan county.....	39,109	58	2	5.1
Berrien county.....	48,391	73	4	8.3
Cass county.....	20,500	29	.8	3.9
Van Buren county.....	33,416	60	2	6.0
SOUTHERN CENTRAL DIVISION.....	319,948	570	13.7	4.3
Branch county.....	26,120	36	1	3.8
Calhoun county.....	51,384	68	1	1.9
Hillsdale county.....	29,952	48	.9	3.0
Jackson county.....	47,027	90	2	4.3
Kalamazoo county.....	47,157	115	3	6.4
Lenawee county.....	48,912	98	2	5.0
St. Joseph county.....	23,957	43	.8	3.3
Washtenaw county.....	45,439	72	3	6.6
SOUTHEASTERN DIVISION.....	464,092	870	68	14.7
Macomb county.....	32,852	66	5	15.2
Monroe county.....	33,151	45	1	3.0
Oakland county.....	44,643	60	2	4.5
Wayne county.....	353,446	699	60	17.0

*†These footnotes are below Table 58, on a preceding page.

PREVALENCE OF SCARLET FEVER IN URBAN AND RURAL LOCALITIES.

As shown in Table 61, the death rates from scarlet fever were greater in the urban than in the rural localities.

By Table 61A, it may be seen that, in 1909, the urban localities which showed much higher death rates from scarlet fever than the death rate for this disease for the entire State (10.1 per 100,000 population) for that year, were: Bay City, Benton Harbor, Cadillac, Detroit, Grand Rapids, Iron Mountain, Ironwood, Ishpeming, Menominee, Mt. Clemens, Muskegon, Negaunee, Norway, St. Joseph, Wyandotte and Ypsilanti.

The localities, shown in Table 61A, in which the death rates were much lower in 1909 than the rate for the entire State for that year, were: Battle Creek, Calumet township, Flint, Kalamazoo, Saginaw and Traverse City.

The localities, shown in Table 61A, which showed much higher death rates from scarlet fever in 1909 than the average for such localities in the years, 1904-1908, were: Battle Creek, Bay City, Benton Harbor, Cadillac, Detroit, Grand Rapids, Holland, Ironwood, Ishpeming, Jackson, Kalamazoo, Menominee, Mt. Clemens, Muskegon, Negaunee, Norway, Saginaw, St. Joseph and Traverse City.

The localities, shown in Table 61A, which showed much lower death rates from scarlet fever in 1909 than the average for such localities in the years 1904-1908, were: Calumet township, Laurium and Wyandotte.

There were no deaths from scarlet fever in 1909 in Adrian, Albion, Alpena, Ann Arbor, Big Rapids, Charlotte, Cheboygan, Coldwater, Escanaba, Grand Haven, Hancock, Hillsdale, Houghton, Ionia, Lansing, Ludington, Manistee, Manistique, Marquette, Monroe, Mt. Pleasant, Niles, Owosso, Petoskey, Pontiac, Port Huron and Sault Ste. Marie.

TABLE 61.—*The prevalence of scarlet fever in urban and rural localities, in Michigan, in 1909.*

Localities—Grouped according to density of population.	Population.*	Health jurisdictions.			Cases.	Deaths.	Death rates per 100,000 of the population.
		Total.	Infected.				
			Number.	Per cent of all jurisdictions.			
Cities over 50,000.....	524,498	3	3	100	2,105	108	20.6
Cities from 25,000 to 50,000.....	154,255	5	5	100	548	20	13.0
Cities from 10,000 to 25,000 and Calumet township (18,628).....	222,289	16	15	94	348	24	10.8
Cities and villages from 5,000 to 10,000.....	185,982	28	21	75	308	32	17.2
Cities and villages under 5,000†.....	352,905	325	86	26	494	20	5.7
Total urban.....	1,439,929	377	130	34	3,803	204	14.2
Balance of localities—principally townships‡....	1,226,380	1,284	282	22	1,350	64	5.2

*This footnote is below Table 58, on a preceding page.

†Exclusive of 57 cities and villages, for which the population in 1909 cannot be correctly estimated.

‡Includes the 57 cities and villages mentioned in the preceding paragraph, but does not include Calumet township, which, for the purpose of this study, is included in the third group of urban localities, which have corresponding populations.

TABLE 61A.—*The prevalence of scarlet fever in 1909, and preceding years, in each of the principal localities included in the first four groups in Table 61.*

Localities.	1909.				Average, 1904-1908.			
	Popula- tion.*	Cases.	Deaths.	Deaths per 100,000 inhab- itants.	Popula- tion.*	Cases.	Deaths.	Deaths per 100,000 inhab- itants.
Adrian.....	11,963	2	0		11,193	3	.6	5.4
Albion.....	5,473	0	0		5,155	6	0	
Alpena.....	13,148	0	0		12,699	.6	.2	1.6
Ann Arbor.....	14,712	15	0		14,643	18	0	
Battle Creek.....	26,776	46	1	3.7	24,038	20	.2	.8
Bay City.....	40,509	404	15	37.0	37,989	†47	5	13.2
Benton Harbor.....	6,877	47	3	43.6	6,772	7	0	
Big Rapids.....	5,060	1	0		4,935	2	.2	4.1
Cadillac.....	8,013	9	2	25.0	7,341	8	1	13.6
Calumet township.....	18,628	91	1	5.4	17,813	51	6	33.7
Charlotte.....	5,519	10	0		5,043	5	0	
Cheboygan.....	7,032	0	0		6,851	7	0	
Coldwater.....	6,237	0	0		6,230	.8	.2	3.2
Detroit.....	366,646	1,196	87	23.7	338,435	494	64	18.9
Escanaba.....	13,035	7	0		11,873	5	.8	6.7
Flint.....	17,111	2	1	5.8	15,775	31	.8	5.1
Grand Haven.....	5,859	20	0		5,487	9	0	
Grand Rapids.....	105,910	851	19	17.9	99,795	265	7	7.0
Hancock.....	8,521	0	0		7,030	†	.4	5.7
Hillsdale.....	5,632	3	0		5,138	7	.4	7.8
Holland.....	10,436	56	1	9.6	9,554	15	.6	6.3
Houghton.....	5,581	0	0		4,839	.2	0	
Ionia.....	5,239	9	0		5,229	4	0	
Iron Mountain.....	7,764	3	1	12.9	8,256	20	1	12.1
Ironwood.....	10,412	†	16	153.7	10,176	†	1	9.8
Ishpeming.....	9,583	52	4	41.7	10,807	30	1	9.3
Jackson.....	25,450	39	2	7.9	25,360	38	1	3.9
Kalamazoo.....	36,505	43	2	5.5	32,471	44	1	3.1
Lansing.....	25,015	16	0		22,172	14	.2	.9
Laurium.....	10,166	3	1	9.8	8,638	†	4	46.2
Ludington.....	7,376	2	0		7,306	3	.2	2.7
Manistee.....	10,768	12	0		11,932	6	.6	5.0
Manistiquie.....	5,184	0	0		4,831	.2	0	
Marquette.....	11,424	†	0		10,969	17	.4	3.6
Menominee.....	8,944	†	3	33.5	10,235	.8	0	
Monroe.....	7,485	23	0		6,671	3	.2	3.0
Mt. Clemens.....	7,773	2	1	12.9	7,374	4	.2	2.7
Mt. Pleasant.....	5,512	10	0		4,895	8	.2	4.1
Muskegon.....	26,995	84	3	14.3	20,937	101	2	9.6
Negaunee.....	6,625	10	1	15.1	6,728	9	.6	8.9
Niles.....	5,084	1	0		4,819	3	0	
Norway.....	5,732	22	1	17.4	5,211	2	.2	3.8
Owosso.....	9,707	0	0		9,370	2	0	
Petoskey.....	5,002	4	0		5,130	3	0	
Pontiac.....	12,278	8	0		11,442	.2	.2	1.7
Port Huron.....	21,116	22	0		20,463	40	1	4.9
Saginaw.....	51,942	58	2	3.9	48,743	31	1	2.1
St. Joseph.....	5,531	†	13	235.0	5,406	.4	.2	3.7
Sault Ste. Marie.....	12,572	0	0		11,894	11	.6	5.0
Traverse City.....	13,525	20	1	7.4	12,152	18	.4	3.3
Wyandotte.....	5,728	54	1	17.5	5,546	5	2	36.1
Ypsilanti.....	7,849	7	2	25.5	7,092	6	0	

*Estimated for intercensal years.

†Does not include West Bay City for 1904, which was consolidated with Bay City in 1905.

‡Fatal cases only reported.

THE REPORTED SOURCES OF CONTAGIUM IN SCARLET FEVER.

By reference to Table 62 it may be seen that, in the years 1906-1909, in less than eight per cent of the outbreaks of scarlet fever was the source of contagium traced by the health officers.

Of the outbreaks in which the source of contagium was definitely traced, over 59 per cent were said to be due to infection from former cases in the same locality, and 40 per cent to infection from outside jurisdictions.

The places from which and to which scarlet fever was spread in 1909 are shown in Table 63.

TABLE 62.—*The reported sources of contagium in scarlet fever, in Michigan, in the four years, 1906-1909, as indicated by the number and per cent of instances in which each of the given sources was responsible for the introduction of the disease into a household.*

Sources.	Number of instances.	Per cent of instances in which a source was given.
Traced to former cases in the same locality.....	431	58.7
Outside jurisdictions.....	290	39.5
Infected premises, clothing, etc.....	13	1.8
Not stated or statements doubtful.....	8,796	*92.3

*Per cent of all households in which scarlet fever occurred.

TABLE 63.—*The localities from which and to which scarlet fever was spread during the year 1909.*

Spread from:	To:	Spread from:	To:
Allegan county, Otsego village.	Allegan county, Wayland township.	Eaton county, Charlotte city.	Eaton county, Benton township.
Arenac county, Twining village.	Oakland county, Pontiac city.	Genesee county, Clio village.	Genesee county, Vienna township.
Barry county, Hastings city.	Barry county, Prairieville township.	Genesee county, Flint city.	Genesee county, Flint township.
Bay county, Bay City city.	Bay county, Portsmouth township.	Genesee county, Flint city.	Lapeer county, Oregon township.
Bay county, Bay City city.	Genesee county, Thetford township.	Grand Traverse county, Green Lake township.	Benzie county, Colfax township.
Bay county, Bay City city.	Tuscola county, Gilford township.	Hillsdale county— Pittsford township.	Lenawee county, Hudson city.
Bay county, Bay City city.	Wayne county, Wayne village.	Ingham county, Lansing city.	Ingham county, Aurelius township.
Benzie county, Thompsonville village.	Manistee county, Onkama township.	Jackson county, Henrietta township.	Livingston county, Unadilla township.
Berrien county, Bainbridge township.	Berrien county, Benton Harbor city.	Kent county, Grand Rapids city.	Ingham county, East Lansing city.
Branch county, Union City village.	Calhoun county, Burlington township.	Kent county, Grand Rapids city.	Ionia county, Ionia city.
Calhoun county, Battle Creek city.	Calhoun county, Emmet township.	Kent county, Grand Rapids city.	Kent county, Bowne township.
Calhoun county, Battle Creek city.	Calhoun county, Le Roy township.	Kent county, Grand Rapids city.	Kent county, Grandville village.
Calhoun county, Bedford township.	Kalamazoo county, Ross township.	Kent county, Grand Rapids city.	Kent county, Rockford village.
Calhoun county, Newton township.	Calhoun county, Le Roy township.	Kent county, Grand Rapids city.	Kent county, Tyrone township.
Clinton county, Fowler village.	Clinton county, Dallas township.	Kent county, Grand Rapids city.	Kent county, Walker township.

TABLE 63.—CONTINUED.

Spread from:	To:	Spread from:	To:
Kent county, Grand Rapids city.	Kent county, Wyoming township.	Newaygo county, Garfield township.	Newaygo county, Big Prairie township.
Kent county, Grand Rapids city.	Mecosta county, Big Rapids city.	Oceana county, Hart village.	Oceana county, Weare township.
Kent county, Grand Rapids city.	Montcalm county, Greenville city.	Oceana county, Shelby village.	Oceana county, Benona township.
Kent county, Grand Rapids city.	Oceana county, Weare township.	Ogemaw county, Churchill township.	Ogemaw county, West Branch township.
Kent county, Grand Rapids city.	Ottawa county, Georgetown township.	Ottawa county, Allendale township.	Ottawa county, Polkton township.
Kent county, Grand Rapids city.	Ottawa county, Jamestown township.	Ottawa county, Zeeland village.	Ottawa county, Jamestown township.
Kent county, Grandville village.	Ionia county, Lake Odessa village.	St. Clair county, Port Huron city.	Presque Isle county, Onaway city.
Kent county, Gratton township.	Kent county, Vergennes township.	Sanilac county, Brown City city.	Clare county, Sheridan township.
Kent county, Sparta township.	Kent county, Algoma township.	Van Buren county, Bangor village.	Van Buren county, South Haven city.
Lenawee county, Clinton village.	Washtenaw county, Bridgewater township.	Washtenaw county, Ann Arbor city.	Ionia county, Easton township.
Mecosta county, Deerfield township.	Montcalm county, Lakeview village.	Wayne county, Detroit city.	Macomb county, Warren township.
Monroe county, Dundee village.	Washtenaw county, Milan village.	Wayne county, Detroit city.	Monroe county, Milan township.
Monroe county, Milan village.	Monroe county, Milan township.	Wayne county, Detroit city.	Oakland county, Orion village.
Monroe county, Monroe city.	Lenawee county, Palmyra township.	Wayne county, Detroit city.	Oakland county, Oxford village.
Montcalm county, Edmore village.	Gratiot county, St. Louis city.	Wayne county, Detroit city.	Wayne county, Dearborn township.
Montcalm county, Edmore village.	Montcalm county, Belvidere township.	Wayne county, Detroit city.	Wayne county, Northville village.

TABLE 63.—CONCLUDED.

Spread from:	To:	Spread from:	To:
Wayne county, Plymouth village.	Wayne county, Canton township.	Indiana, South Bend.	Berrien county, Niles city.
Wayne county, Plymouth village.	Wayne county, Livonia township.	Ohio, (No locality given).	Hillsdale county, Wright township.
Wexford county, Cadillac city.	Wexford county, South Branch township.	Ohio, (No locality given).	Wayne county, Springwells township.
FROM OUTSIDE THE STATE TO LOCALITIES IN MICHIGAN.		Wisconsin, Hurley.	Gogebic county, Bessemer township.
Colorado, (No locality given).	Grand Traverse county, Acme township.		

RESTRICTIVE AND PREVENTIVE MEASURES IN SCARLET FEVER.

By reference to Table 64 it will be seen that, in the years 1906-9, the restrictive and preventive measures (placarding, isolation and disinfection), in scarlet fever, were stated to have been enforced in eighty-five per cent and neglected in six per cent of the households in which the disease occurred. There is a strong probability that in nearly 10 per cent of the households in which no statement was made relative to the restrictive and preventive measures, that they were not enforced.

By a comparison of Table 64 with the corresponding table on page 137 of the annual report of this Department for 1906, it will be seen that, under the old plan of reporting and compiling by *outbreaks*, the percentage of instances in which the restrictive measures were enforced was but one-third of that under the new method of compiling by *households*. This is taken as a striking example of one of the imperfections of the old plan of reporting and not as an indication that a radical improvement has taken place in the matter of restricting the disease.

In view of the fact that this Department has conducted an active campaign against scarlet fever for 25 years, the results, at least in recent years, should be marked by a decreased prevalence of the disease in each year. That this is not so, is believed to be due to the fact that very many new health officers have to be educated each year in the method of restricting the disease, and the further fact, that, in the majority of instances, the health officers are not only underpaid, but are often denied the support and appreciation that their labors demand, and in some instances they are even subjected to abuse. Under these conditions it is not strange that the prevalence of this disease does not gradually decrease.

TABLE 64.—*Restrictive and preventive measures in scarlet fever, in Michigan, in the four years, 1906-1909.*

Restrictive and preventive measures.	Number of households.	Per cent.
PLACARDING, ISOLATION AND DISINFECTION:		
Enforced.....	8,076	84.7
Neglected.....	530	5.6
Not stated or statements doubtful.....	924	9.7

Table 65 is somewhat similar to tables showing the results of efforts for the restriction of scarlet fever, in the annual reports of this Department up to and including the year 1904. It is believed that a continuation of Table 65 for a number of years will show much better results than were shown by the tables in past years, when scarlet fever was studied by outbreaks.

TABLE 65.—*Showing the total number of households in which scarlet fever was present during the four years, 1906-1909, and the total and average number of cases and deaths in each household in which the restrictive measures were enforced or neglected.*

	Total number of households, 9,530.		Restrictive measures enforced in 8,076 households.		Restrictive measures neglected in 530 households.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals.....	13,820	851	11,421	659	1,020	50
Average number per household.....	1.45	.09	1.41	.08	1.92	.09

MEASLES IN MICHIGAN IN 1909 AND PRECEDING YEARS.

GENERAL PREVALENCE.

During the year 1909, measles was reported present, in this State, in 4,834 households, with a total of 9,047 cases, including 224 deaths.

As only the fatal cases of measles were reported from many localities, it was impossible to determine the number of infected households or the cases occurring therein.

By reference to Table 66 it may be seen that, in 1909, compared with the preceding year, there were 4,272 cases and 103 deaths more.

In 1909, compared with the average for the nineteen years, 1890-1908, there were 1,896 less cases and 84 more deaths, and the deaths per 100,000 inhabitants were 2.1 more.

A comparison of the death rates in Tables 66 and 67 indicates that, with the exception of the year 1900, as a rule, measles was much more prevalent in the years prior to the inauguration, by this Department, in 1890, of active measures for its restriction, than in the years since that time.

TABLE 66.—*The prevalence of measles, in Michigan, during the twenty years, 1890-1909.*

Years.	Population.*	Reported cases.	Reported deaths.	Deaths per 100 cases.	Deaths per 100,000 of the population.
1890.....	2,093,889	11,911	140	1.2	6.7
1891.....	2,130,827	12,173	149	1.2	7.0
1892.....	2,167,765	3,830	76	2.0	3.5
1893.....	2,204,703	7,334	119	1.6	5.4
1894.....	2,241,641	10,518	55	.5	2.5
1895.....	2,271,531	3,870	12	.3	.5
1896.....	2,301,421	15,409	156	1.0	6.8
1897.....	2,331,311	32,543	159	.5	6.8
1898.....	2,361,201	11,614	124	1.1	5.3
1899.....	2,391,091	12,005	166	1.4	6.9
1900.....	2,420,982	20,403	282	1.4	11.6
1901.....	2,450,872	4,629	62	1.3	2.5
1902.....	2,475,499	11,978	162	1.4	6.5
1903.....	2,502,758	8,941	140	1.6	5.6
1904.....	2,530,016	10,386	176	1.7	7.0
1905.....	2,557,275	6,061	111	1.8	4.3
1906.....	2,584,533	7,403	188	2.5	7.3
1907.....	2,611,792	12,139	252	2.1	9.6
1908.....	2,639,050	4,775	121	2.5	4.6
1909.....	2,666,309	9,047	224	2.5	8.0
Average per year.....	2,396,723	10,848	144	1.3	6.0

*Estimated for intercensal years.

TABLE 67.—*The number of deaths from measles, in Michigan, per 100,000 persons living, in each of the twenty-one years, 1869-1889. Compiled from the Secretary of State's Vital Statistics of Michigan.*

Years.....	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.
Deaths.....	12.9	4.7	5.5	14.1	18.6	3.4	9.5	8.1	4.1	1.0	10.5
Years.....	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Av. 1869- 1889.
Deaths.....	7.6	15.2	8.7	14.5	7.9	2.0	6.8	14.6	20.6	5.1	9.3

GEOGRAPHICAL DISTRIBUTION OF MEASLES.

Table 68 shows that, as indicated by the average death rate for the entire State for the seventeen years, 1893-1909 (6.0 per 100,000 inhabitants), measles was much more prevalent than the average in the Upper Peninsular and Northern Divisions.

The counties in which measles was unusually prevalent in the seventeen years, 1893-1909, placed in the order of greatest death rates, are:

Rosecommon.....	with a death rate of 18.5 per 100,000
Alger.....	" " " " " 18.3 " "
Montmorency.....	" " " " " 18.2 " "
Keweenaw.....	" " " " " 18.0 " "
Bay.....	" " " " " 17.3 " "
Baraga.....	" " " " " 15.8 " "
Antrim.....	" " " " " 13.6 " "
Kalkaska.....	" " " " " 13.0 " "
Marquette.....	" " " " " 12.7 " "
Alcona.....	" " " " " 12.6 " "
Delta.....	" " " " " 12.1 " "
Luce.....	" " " " " 12.1 " "
Dickinson.....	" " " " " 11.5 " "
Oceana.....	" " " " " 11.4 " "
Missaukee.....	" " " " " 10.7 " "
Oscoda.....	" " " " " 10.7 " "
Benzie.....	" " " " " 9.7 " "
Mecosta.....	" " " " " 9.7 " "
Ogemaw.....	" " " " " 9.0 " "
Houghton.....	" " " " " 8.1 " "
Otsego.....	" " " " " 7.8 " "
Branch.....	" " " " " 7.7 " "

TABLE 68.—*The geographical distribution of measles, in Michigan, in the seventeen years, 1893-1909, as indicated by the average number of cases and deaths, and the average deaths per 100,000 persons living in each geographical division shown in the table.*

Geographical Divisions.	Average.			
	Population.*	Cases.	Deaths.	Death rates.
UPPER PENINSULAR DIVISION.....	254,234	1,267	22.4	8.8
Alger county.....	5,453	28	1	18.3
Baraga county.....	5,049	6	.8	15.8
Chippewa county.....	20,062	53	1	5.0
Delta county.....	24,875	67	3	12.1
Dickinson county.....	17,438	47	2	11.5
Gogebic county.....	16,262	84	1	6.1
Houghton county.....	61,876	361	5	8.1
Iron county.....	7,950	37	.4	5.0
Keweenaw county.....	3,881	21	.7	18.0
Luce county.....	3,294	15	.4	12.1
Mackinac county.....	7,749	42	.2	2.6
Marquette county.....	39,521	347	5	12.7
Menominee county.....	25,519	27	1	3.9
Ontonagon county.....	6,971	45	.5	7.2
Schoolcraft county.....	8,334	87	.4	4.8
NORTHWESTERN DIVISION.....	87,755	454	5.6	6.4
Benzie county.....	10,330	92	1	9.7
Grand Traverse county.....	21,917	103	1	4.6
Leelanau county.....	10,601	40	.6	5.7
Manistee county.....	27,074	161	2	7.4
Wexford county.....	17,833	58	1	5.6
NORTHERN DIVISION.....	77,829	419	6.4	8.2
Antrim county.....	14,673	97	2	13.6
Charlevoix county.....	14,567	83	.8	5.5
Cheboygan county.....	16,396	28	1	6.1
Crawford county.....	3,395	28	.2	5.9
Emmet county.....	15,449	115	1	6.5
Kalkaska county.....	6,931	51	.9	13.0
Otsego county.....	6,418	17	.5	7.8
NORTHEASTERN DIVISION.....	57,928	215	4.0	6.8
Alcona county.....	5,575	44	.7	12.6
Alpena county.....	19,461	45	1	5.1
Iosco county.....	10,709	25	.4	3.7
Montmorency county.....	3,288	32	.6	18.2
Ogemaw county.....	7,798	37	.7	9.0
Oscoda county.....	1,865	2	.2	10.7
Presque Isle county.....	9,232	30	.4	4.3
WESTERN DIVISION.....	274,450	1,927	14.2	5.2
Kent county.....	134,792	1,232	6	4.5
Lake county.....	5,247	33	.2	3.8
Mason county.....	19,592	65	1	5.1
Muskegon county.....	36,824	175	2	5.4
Newaygo county.....	18,605	75	1	5.4
Oceana county.....	17,521	123	2	11.4
Ottawa county.....	41,869	224	2	4.8
NORTHERN CENTRAL DIVISION.....	104,195	541	7.0	6.7
Clare county.....	8,837	57	.5	5.7
Gladwin county.....	7,369	17	.4	5.4
Isabella county.....	23,652	143	1	4.2
Mecosta county.....	20,605	127	2	9.7
Midland county.....	14,594	62	.8	5.5
Missaukee county.....	9,336	42	1	10.7
Osceola county.....	18,183	83	1	5.5
Roscommon county.....	1,619	10	.3	18.5

*Estimated for intercensal years.

TABLE 68.—CONCLUDED.

Geographical Divisions.	Average.			
	Population.*	Cases.	Deaths.	Death rates.
BAY AND EASTERN DIVISION.....	345,291	1,098	22.1	6.4
Arenac county.....	9,136	16	.1	1.1
Bay county.....	63,651	234	11	17.3
Huron county.....	34,659	54	1	2.9
Lapeer county.....	27,691	133	1	3.6
Saginaw county.....	84,336	285	3	3.6
Sanilac county.....	34,753	123	2	5.8
St. Clair county.....	55,345	179	2	3.6
Tuscola county.....	35,720	74	2	5.6
CENTRAL DIVISION.....	316,590	1,584	13.3	4.2
Barry county.....	22,661	159	.7	3.1
Clinton county.....	25,596	124	.8	3.1
Eaton county.....	31,530	241	1	3.2
Genesee county.....	42,148	175	2	4.7
Gratiot county.....	29,881	157	2	6.7
Ingham county.....	42,689	174	2	4.7
Ionia county.....	35,144	148	1	2.8
Livingston county.....	19,224	102	.8	4.2
Montcalm county.....	33,980	102	2	5.9
Shiawassee county.....	33,737	202	1	3.0
SOUTHWESTERN DIVISION.....	141,934	844	7.0	4.9
Allegan county.....	39,104	236	2	5.1
Berrien county.....	48,756	265	3	6.2
Cass county.....	20,486	114	1	4.9
Van Buren county.....	33,588	229	1	3.0
SOUTHERN CENTRAL DIVISION.....	321,000	2,077	14	4.4
Branch county.....	26,094	220	2	7.7
Calhoun county.....	51,788	385	3	5.8
Hillsdale county.....	29,934	191	2	6.7
Jackson county.....	47,109	237	1	2.1
Kalamazoo county.....	47,563	392	2	4.2
Lenawee county.....	48,938	305	1	2.0
St. Joseph county.....	23,949	155	1	4.2
Washtenaw county.....	45,625	192	2	4.4
SOUTHEASTERN DIVISION.....	469,017	633	31	6.6
Macomb county.....	32,911	73	2	6.1
Monroe county.....	33,214	99	1	3.0
Oakland county.....	44,846	241	2	4.5
Wayne county.....	358,046	220	26	7.3

*Estimated for intercensal years.

REPORTED SOURCES OF CONTAGIUM IN MEASLES.

Of the outbreaks in 19,162 households in which measles occurred in the four years, 1906-1909, the source of infection was traced in but 3,469 instances, or eighteen per cent of the whole number of outbreaks, particulars relative to which may be found in Table 69.

The localities from which and to which measles was spread in 1909 are shown in Table 70.

TABLE 69.—*The reported sources of contagium in measles, in Michigan, in the four years, 1906-1909, as indicated by the number and per cent of instances in which each of the given sources was responsible for the introduction of the disease into a household.*

Sources.	Number of instances.	Per cent of all instances in which a source was given.
Traced to former cases in the same locality.....	2,085	60.1
Outside jurisdictions.....	1,381	39.8
Infected clothing, mail, etc.....	3	.1
Not stated or statements doubtful.....	15,693	*81.9

*Per cent of all households in which measles occurred.

TABLE 70.—*Localities from which and to which measles was spread, during the year 1909.*

Spread from:	To:	Spread from:	To:
Allegan county, Clyde township.	Allegan county, Manlius township.	Calhoun county, Bedford township.	Barry county, Maple Grove township.
Allegan county, Douglas village.	Allegan county, Ganges township.	Calhoun county, (No locality given).	Eaton county, Kalama township.
Allegan county, Fennville village.	Allegan county, Ganges township.	Cass county, Cassopolis village.	Cass county, Penn township.
Allegan county, Hopkins township.	Allegan county, Watson township.	Cass county, Cassopolis village.	Cass county, Volinia township.
Allegan county, Saugatuck village.	Allegan county, Douglas village.	Charlevoix county, Charlevoix city.	Emmet county, McKinley township.
Allegan county, Saugatuck village.	Allegan county, Wayland township.	Charlevoix county, East Jordan village.	Antrim county, Kearney township.
Alpena county, Alpena city.	Alcona county, Harrisville city.	Cheboygan county, Mentor township.	Cheboygan county, Tuscarora township.
Alpena county, Alpena city.	Presque Isle county, Belknap township.	Chippewa county, Trout Lake township.	Chippewa county, Rudyard township.
Barry county, Nashville village.	Barry county, Maple Grove township.	Chippewa county, Trout Lake township.	Chippewa county, Sault Ste. Marie city.
Barry county, Nashville village.	Barry county, Middleville village.	Clare county, Farwell village.	Clare county, Surrey township.
Bay county, Bay City city.	Bay county, Portsmouth township.	Clare county, Grant township.	Roscommon county, Roscommon village.
Benzie county, Blaine township.	Benzie county, Gilmore township.	Crawford county, Frederic township.	Crawford county, Grayling village.
Branch county, Coldwater city.	Clare county, Hatton township.	Delta county, Escanaba city.	Delta county, Gladstone city.
Branch county, Coldwater city.	Midland county, Porter township.	Dickinson county, (No locality given).	Iron county, Bates township.
Calhoun county, Albion city.	Calhoun county, Homer village.	Eaton county, Charlotte city.	Eaton county, Benton township.
Calhoun county, Albion township.	Calhoun county, Clarendon township.	Eaton county, Delta township.	Eaton county, Dimondale village.

TABLE 70.—CONTINUED.

Spread from:	To:	Spread from:	To:
Eaton county, Olivet village.	Eaton county, Brookfield township.	Gratiot county, Ashley village.	Isabella county, Coe township.
Emmet county, Maple River township.	Emmet county, Littlefield township.	Gratiot county, (No locality given).	Midland county, Greendale township.
Emmet county, Petoskey city.	Emmet county, Harbor Springs village.	Hillsdale county, Cambria township.	Hillsdale county, Hillsdale city.
Emmet county, Petoskey city.	Emmet county, Littlefield township.	Hillsdale county, Jonesville village.	Jackson county, Hanover township.
Genesee county, Clio village.	Genesee county, Thetford township.	Hillsdale county, Montgomery village.	Hillsdale county, Camden township.
Genesee county, Flint city.	Genesee county, Clio village.	Hillsdale county, (No locality given).	Jackson county, Grass Lake township.
Genesee county, Flint city.	Genesee county, Mt. Morris village.	Hillsdale county, Waldron village.	Hillsdale county, Amboy township.
Genesee county, Flint city.	Genesee county, Vienna township.	Hillsdale county, Waldron village.	Hillsdale county, Ransom township.
Genesee county, Flint city.	Huron county, McKinley Springs.	Hillsdale county, Waldron village.	Hillsdale county, Wright township.
Genesee county, Flint city.	Livingston county, Cohoctah township.	Ingham county, Lansing city.	Eaton county, Roxand township.
Genesee county, Flint city.	Macomb county, Memphis village.	Ingham county, Lansing city.	Ingham county, Delbi township.
Genesee county, Flint city.	Tuscola county, Vassar village.	Ingham county, Lansing city.	Wayne county, Northville village.
Genesee county, Mt. Morris village.	Genesee county, Thetford township.	Ingham county, Mason city.	Ingham county, Ingham township.
Genesee county, Mt. Rose township.	Genesee county, Vienna township.	Ingham county, Mason city.	Ingham county, Vevay township.
Grand Traverse county, Fife Lake township.	Oceana county, Elbridge township.	Ionia county, Campbell township.	Ionia county, Easton township.
Grand Traverse county, Traverse City city.	Antrim county, Forest Home township.	Iosco county, Plainfield township.	Iosco county, Reco township.

TABLE 70.—CONTINUED.

Spread from:	To:	Spread from:	To:
Isabella county, Mt. Pleasant city.	Saginaw county, Tittabawassee township.	Lenawee county, Tecumseh village.	Lenawee county, Tecumseh township.
Jackson county, Jackson city.	Jackson county, Concord village.	Mackinac county, St. Ignace city.	Mackinac county, Mackinac Island city.
Kalamazoo county, Kalamazoo city.	Allegan county, Gun Plains township.	Mackinac county, St. Ignace city.	Rosecommon county, Rosecommon village.
Kalamazoo county, Kalamazoo city.	Kalamazoo county, Vicksburg village.	Macomb county, New Baltimore village.	Macomb county, Chesterfield township.
Kalamazoo county, Kalamazoo city.	Kent county, Cascade township.	Monroe county, Ash township.	Monroe county, Berlin township.
Kalamazoo county, Richland village.	Allegan county, Gun Plains township.	Montcalm county, Greenville city.	Kent county, Oakfield township.
Kalkaska county, Boardman village.	Kalkaska county, Orange township.	Montcalm county, Greenville city.	Montcalm county, Fairplain township.
Kalkaska county, Kalkaska village.	Kalkaska county, Garfield township.	Montmorency county, Albert township.	Oscoda county, Clinton township.
Kent county, Cascade township.	Kent county, Ada township.	Muskegon county, Muskegon city.	Muskegon county, Muskegon Heights city.
Kent county, Grand Rapids city.	Barry county, Hastings city.	Newaygo county, Beaver township.	Oceana county, Newfield township.
Kent county, Grand Rapids city.	Ionia county, Campbell township.	Newaygo county, Fremont village.	Ottawa county, Jamestown township.
Kent county, Grand Rapids city.	Kent county, Byron township.	Oakland county, Clarkston village.	Oakland county, Springfield township.
Kent county, Grand Rapids city.	Ottawa county, Holland city.	Oakland county, Highland township.	Oakland county, White Lake township.
Lapeer county, Dryden village.	Lapeer county, Dryden township.	Oakland county, Holly village.	Oakland county, Springfield township.
Lenawee county, Clinton township.	Lenawee county, Tecumseh township.	Oakland county, (No locality given).	Genesee county, Richfield township.
Lenawee county, Tecumseh village.	Lenawee county, Clinton township.	Oakland county, Pontiac city.	Lapeer county, Oregon township.

TABLE 70.—CONTINUED.

Spread from:	To:	Spread from:	To:
Oakland county, Pontiac city.	Montmorency county, Briley township.	Ottawa county, Grand Haven city.	Oscoda county, Crockery township.
Oakland county, Pontiac city.	Oakland county, Oxford village.	Ottawa county, Grand Haven city.	Ottawa county, Grand Haven township.
Oakland county, Pontiac city.	Oakland county, Springfield township.	Ottawa county, Grand Haven city.	Ottawa county, Olive township.
Oakland county, Pontiac city.	Oakland county, West Bloomfield township.	Ottawa county, Holland city.	Ottawa county, Olive township.
Oakland county, Pontiac city.	Oakland county, White Lake township.	Presque Isle county, Rogers City village.	Presque Isle county, Rogers township.
Oceana county, Hesperia village.	Oceana county, Newfield township.	Roscommon county, (No locality given).	Missaukee county, Clam Union township.
Ogemaw county, Cumming township.	Ogemaw county, West Branch township.	Roscommon county, Richfield township.	Roscommon county, Nester township.
Ogemaw county, West Branch city.	Genesee county, Clio village.	Saginaw county, Frankennuth township.	Saginaw county, Blumfield township.
Ogemaw county, West Branch city.	Lenawee county, Tecumseh village.	Saginaw county, Saginaw city.	Bay county, Portsmouth township.
Ogemaw county, West Branch city.	Montmorency county, Albert township.	Saginaw county, Saginaw city.	Gratiot county, Alma city.
Ogemaw county, West Branch city.	Ogemaw county, Klacking township.	Saginaw county, Saginaw city.	Midland county, Edenville township.
Ogemaw county, West Branch city.	Roscommon county, Roscommon village.	Saginaw county, Saginaw city.	Montcalm county, Lakeview village.
Ontonagon county, Stannard township.	Ontonagon county, McMillan township.	St. Clair county, Kimball township.	Oakland county, Waterford township.
Oscoda county, Marion township.	Lenawee county, Adrian township.	St. Clair county, Port Huron city.	St. Clair county, Columbus township.
Oscoda county, Reed City village.	Oscoda county, Hersey township.	St. Clair county, Port Huron city.	St. Clair county, Grant township.
Ottawa county, Crockery township.	Muskegon county, Fruitport village.	St. Clair county, St. Clair city.	St. Clair county, St. Clair township.

TABLE 70.—CONTINUED.

Spread from:	To:	Spread from:	To:
St. Joseph county, Colon village.	Branch county, Mattison township.	Van Buren county, South Haven city.	Van Buren county, Hartford township.
St. Joseph county, Leonidas township.	St. Joseph county, Mendon village.	Washtenaw county, Ann Arbor city.	Livingston county, Howell village.
St. Joseph county, Mendon village.	St. Joseph county, Park township.	Washtenaw county, Dexter village.	Calhoun county, Marengo township.
Schoolcraft county, Manistique township.	Schoolcraft county, Doyle township.	Washtenaw county, Dexter village.	Washtenaw county, Chelsea village.
Shiawassee county, Morrice village.	Shiawassee county, Antrim township.	Washtenaw county, Ypsilanti city.	Barry county, Nashville village.
Shiawassee county, Owosso city.	Manistee county, Bear Lake village.	Washtenaw county, Ypsilanti city.	Hillsdale county, Somerset township.
Van Buren county, Bangor township.	Van Buren county, South Haven city.	Washtenaw county, Ypsilanti city.	Hillsdale county, Wright township.
Van Buren county, Covert village.	Berrien county, Coloma village.	Washtenaw county, Ypsilanti city.	Monroe county, Bedford township.
Van Buren county, (No locality given).	Berrien county, Watervliet village.	Wayne county, Delray village.	St. Clair county, Algonac village.
Van Buren county, (No locality given).	Ionia county, Odessa township.	Wayne county, Detroit city.	Calhoun county, Allion city.
Van Buren county, Paw Paw village.	Van Buren county, Waverly township.	Wayne county, Detroit city.	Clinton county, St. Johns city.
Van Buren county, South Haven city.	Allegan county, Casco township.	Wayne county, Detroit city.	Lenawee county, Madison township.
Van Buren county, South Haven city.	Allegan county, Ganges township.	Wayne county, Detroit city.	Macomb county, New Baltimore village.
Van Buren county, South Haven city.	Van Buren county, Bangor village.	Wayne county, Detroit city.	Monroe county, Dundee township.
Van Buren county, South Haven city.	Van Buren county, Covert township.	Wayne county, Detroit city.	Montcalm county, Sidney township.
Van Buren county, South Haven city.	Van Buren county, Geneva township.	Wayne county, Detroit city.	Oakland county, Commerce township.

TABLE 70.—CONTINUED.

Spread from:	To:	Spread from:	To:
Wayne county, Detroit city.	Oakland county, Pontiac city.	Illinois, (No locality given).	Cheboygan county, Burt township.
Wayne county, Detroit city.	Oakland county, Southfield township.	Illinois, (No locality given).	St. Joseph county, White Pigeon township.
Wayne county, Detroit city.	St. Clair county, Columbus township.	Indiana, Columbia City.	Lenawee county, Morenci village.
Wayne county, Detroit city.	St. Clair county, St. Clair city.	Indiana, Gary.	Ottawa county, Holland city.
Wayne county, Detroit city.	St. Clair county, St. Clair township.	Indiana, (No locality given).	Berrien county, Watervliet township.
Wayne county, Detroit city.	Wayne county, Northville village.	Indiana, (No locality given).	Ingham county, Delhi township.
Wexford county, Cadillac city.	Missaukee county, Clam Union township.	Indiana, (No locality given).	Montmorency county, Briley township.
Wexford county, Cadillac city.	Oceana county, Grant township.	Indiana, (No locality given).	Newaygo county, Croton township.
Wexford county, Henderson township.	Wexford county, South Branch township.	Indiana, (No locality given).	St. Joseph county, Colon village.
FROM OUTSIDE THE STATE TO LOCALITIES IN MICHIGAN.		Indiana, (No locality given).	Wexford county, Selma township.
Canada, (No locality given).	Oakland county, Highland township.	Indiana, Ray.	Hillsdale county, Camden township.
Illinois, Chicago.	Allegan county, Manlius township.	Indiana, South Bend.	Cass county, Dowagiac city.
Illinois, Chicago.	Allegan county, Valley township.	Indiana, South Bend.	Van Buren county, Hartford township.
Illinois, Chicago.	Branch county, Coldwater city.	Missouri, St. Louis.	Livingston county, Howell village.
Illinois, Chicago.	Calhoun county, Bedford township.	New York, New York City.	Charlevoix county, Charlevoix city.
Illinois, Chicago.	Shiawassee county, Rush township.	Ohio, Alverton.	Hillsdale county, Wright township.

TABLE 70.—CONCLUDED.

Spread from:	To:	Spread from:	To:
FROM OUTSIDE THE STATE TO LOCALITIES IN MICHIGAN.		Ohio, (No locality given).	St. Joseph county, White Pigeon township.
Ohio, (No locality given).	Arenac county, Lincoln township.	Vermont, Burlington.	Benzie county, Benzonia village.
Ohio, (No locality given).	Hillsdale county, Wright township.	Washington, (No locality given).	Montcalm county, Sheridan village.
Ohio, (No locality given).	Saginaw county, Birch Run township.	Wisconsin, Two Rivers.	Mason county, Ludington city.

RESTRICTIVE AND PREVENTIVE MEASURES IN MEASLES.

Table 71 indicates that in but 40 per cent of the households in which measles occurred, in the years 1906-9, were the restrictive and preventive measures all enforced. The enforcement of these measures in 1909, as compared with the average for the three years, 1906-8, showed but a slight improvement. While this fact is discouraging, to a certain extent, to this Department, still it is a much better showing than when this disease was studied by *outbreaks*, as may be seen by reference to Table 71, on page 148 of the annual report of this Department for 1906, and is an indication of the more scientific method of studying the disease by *households*. The fact that, in 1906-9, forty per cent of the outbreaks of measles were traced to infection from outside jurisdictions, is a very good indication that the disease is not being restricted to any considerable extent.

In the past, the question has frequently arisen as to the necessity for placarding in outbreaks of measles, and many health officers have experienced considerable difficulty in the performance of their duty in this respect. The duty of the health officer is clearly outlined in Section 4450 of the Compiled Laws of 1897, which provides that when any disease dangerous to the public health exists in a locality, the board of health shall use all possible care to prevent the spread of infection, and give public notice of infected places, by placard on the premises and otherwise if necessary.

The apathy of the people in respect to the restriction and prevention of measles has done much to discourage those who would put forth their best energies in the work of restricting this often underestimated but really dangerous disease.

Parents are ignorant of or indifferent to the danger to be apprehended from the exposure of their children to measles, and, in many instances, do not secure the services of a physician for their children when suffering from this disease. Many parents are also ignorant of their duty, under the law, in respect to the reporting of cases of measles to the local health officials, and, as a consequence, the health officials are not in a position to institute restrictive measures or to make complete reports to this Department relative to the prevalence of measles in their locality. To the parents, then, we must look primarily for any considerable reduction in the sickness and mortality from measles, and for more complete reports of the disease. This means educational work on the part of those who have charge of the health service

of the State, both local and general, and the State Health Department stands ready at all times to assist the local health officials in this educational work, by means of advice, and by the furnishing of documents on the restriction and prevention of measles for distribution among the families and neighbors of those sick with the disease. A leaflet issued by the local board of health, setting forth the dangerous character of measles and the duty of householders in outbreaks of the disease, and widely distributed at a time when measles was present in any locality, would, it is believed, prove to be one of the best methods for securing the cooperation of the people in the restriction of the disease. And the educational work should be continued from time to time as measles may appear in the locality until the people are thoroughly awakened to the necessity for its restriction. A suggested form of leaflet for this purpose was printed on page 193 of the annual report of this Board for 1908.

TABLE 71.—*Restrictive and preventive measures in measles, in Michigan, in the four years, 1906-1909.*

Restrictive and preventive measures.	Number of instances.	Per cent.
PLACARDING, ISOLATION AND DISINFECTION:		
Enforced.....	7,712	40
Neglected.....	6,701	35
Not stated or statements doubtful.....	4,749	25

SMALLPOX IN MICHIGAN IN 1909 AND PRECEDING YEARS.

GENERAL PREVALENCE.

During the year 1909, smallpox was reported present in 639 households, in this State, with an aggregate of 1,533 cases, including 4 deaths.

By Table 72 it may be seen that, in 1909, compared with the number of cases and deaths from smallpox in the preceding year, there were 773 less cases, and 4 less deaths.

A comparison of smallpox in 1909 with the years prior to 1901, may be made by reference to Table 72, in which it will be seen that, from 1882 to 1901, there was, comparatively, but little smallpox in the State. The fatality (deaths per 100 cases), however, was very much greater in the years in which deaths occurred prior to 1901.

Table 73 shows that the average number of deaths from smallpox, per 100,000 of the population, for the thirteen years prior to the institution, by this Department, of active measures for the restriction of this disease, was very much greater than the average for the twenty-eight years since that time. Excluding the year 1882, in which the results of the educational work could scarcely be expected to show any marked results, the death rate for the twenty-seven years, ending in 1909, was about six-tenths of one per cent per 100,000 inhabitants.

TABLE 72.—*The prevalence of smallpox, in Michigan, during the twenty-eight years, 1882-1909.*

Years.	Population.*	Reported cases.	Reported deaths.	Deaths per 100 cases.	Deaths per 100,000 of the population.
1882.....	1,745,298	589	159	27.0	9.1
1883.....	1,799,478	29	2	6.9	.1
1884.....	1,853,658	22	3	13.6	.2
1885.....	1,893,697	27	6	22.2	.3
1886.....	1,933,735	24	7	29.2	.4
1887.....	1,973,774	4	0	.....	.....
1888.....	2,013,812	42	6	14.3	.3
1889.....	2,053,851	57	4	7.0	.2
1890.....	2,093,889	2	0	.....	.....
1891.....	2,130,827	3	0	.....	.....
1892.....	2,167,765	1	1	100.0	.05
1893.....	2,204,703	10	3	30.0	.1
1894.....	2,241,641	285	60	21.1	2.7
1895.....	2,271,531	187	47	25.1	2.1
1896.....	2,301,421	38	16	42.1	.7
1897.....	2,331,311	15	0	.....	.....
1898.....	2,361,201	32	1	3.1	.04
1899.....	2,391,091	139	6	4.3	.3
1900.....	2,420,982	694	9	1.3	.4
1901.....	2,450,872	5,088	31	.6	1.3
1902.....	2,475,499	7,086	40	.6	1.6
1903.....	2,502,758	6,341	33	.5	1.3
1904.....	2,530,016	5,753	24	.4	.9
1905.....	2,557,275	2,985	74	2.5	2.9
1906.....	2,584,533	1,240	3	.2	.1
1907.....	2,611,792	1,712	8	.5	.3
1908.....	2,639,050	2,306	8	.3	.3
1909.....	2,666,309	1,533	4	.3	.2
Averages per year.....	2,257,170	1,294	20	1.5	.9

*Estimated for intercensal years.

TABLE 73.—*The number of deaths from smallpox, in Michigan, per 100,000 persons living in each of the thirteen years, 1869-1881. Compiled from the Secretary of State's Vital Statistics of Michigan.*

Years.....	1869.	1870.	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	Average 1869-81.
Deaths.....	3.7	0.8	6.0	23.7	7.0	1.3	1.8	5.2	6.8	0.4	0.4	0.2	4.9	4.8

GEOGRAPHICAL DISTRIBUTION OF SMALLPOX.

Table 74 indicates that, according to the average case rate for smallpox for the entire State (115.6 cases per 100,000 of the population), during the twelve years, 1898-1909, this disease was more prevalent than the average in the Northern, Northeastern, Northern Central and Bay and Eastern Divisions.

As indicated by the case rate for the entire State, the counties in which smallpox was much more than usually prevalent during the twelve years, 1898-1909, placed in the order of greatest case rates, are:

Ogemaw.....	with a case rate of 414.2 per 100,000
Gladwin.....	" " " " 384.3 " "
Cheboygan.....	" " " " 377.1 " "
Arenac.....	" " " " 373.1 " "
Montmorency.....	" " " " 366.9 " "
Isabella.....	" " " " 349.8 " "
Otsego.....	" " " " 340.9 " "
Alcona.....	" " " " 336.8 " "
Bay.....	" " " " 326.0 " "
Missaukee.....	" " " " 324.4 " "
Kalkaska.....	" " " " 323.5 " "
Osceola.....	" " " " 304.8 " "
Roscommon.....	" " " " 304.5 " "
Iosco.....	" " " " 271.1 " "
Clare.....	" " " " 262.2 " "
Gratiot.....	" " " " 247.3 " "
Oceana.....	" " " " 241.4 " "
Mackinac.....	" " " " 236.8 " "
Antrim.....	" " " " 227.3 " "
Lake.....	" " " " 218.3 " "
Oscoda.....	" " " " 210.5 " "
Mecosta.....	" " " " 210.3 " "
Alpena.....	" " " " 205.3 " "
Presque Isle.....	" " " " 200.2 " "
Emmet.....	" " " " 197.1 " "
Saginaw.....	" " " " 181.5 " "
Mason.....	" " " " 176.2 " "
Midland.....	" " " " 174.5 " "
Huron.....	" " " " 172.9 " "
Sanilac.....	" " " " 166.0 " "
Charlevoix.....	" " " " 163.5 " "
Crawford.....	" " " " 161.9 " "
Schoolcraft.....	" " " " 160.1 " "
Clinton.....	" " " " 157.8 " "
Genesee.....	" " " " 156.9 " "
Chippewa.....	" " " " 156.7 " "
Wexford.....	" " " " 151.7 " "
Eaton.....	" " " " 148.2 " "
Menominee.....	" " " " 145.2 " "
Ionia.....	" " " " 145.2 " "
Montcalm.....	" " " " 145.2 " "

TABLE 74.—*The geographical distribution of smallpox, in Michigan, in the twelve years, 1898-1909, as indicated by the average number of cases and deaths, and the average cases per 100,000 persons living, in each geographical division shown in the table.*

Geographical Divisions.	Average.			
	Population.*	Cases.	Deaths.	Case rates.
UPPER PENINSULAR DIVISION.....	270,717	234	1.98	86.4
Alger county.....	6,374	6	0	94.1
Baraga county.....	5,265	6	0	114.0
Chippewa county.....	21,693	34	.3	156.7
Delta county.....	26,804	33	.6	123.1
Dickinson county.....	18,479	8	0	43.3
Gogebic county.....	16,992	9	.08	52.9
Houghton county.....	68,340	36	.3	52.7
Iron county.....	8,775	6	0	68.4
Keweenaw county.....	4,352	2	0	46.0
Luce county.....	3,700	4	0	108.1
Mackinac county.....	8,024	19	.2	236.8
Marquette county.....	39,910	17	.3	42.6
Menominee county.....	26,176	38	.2	145.2
Ontonagon county.....	7,133	2	0	28.0
Schoolcraft county.....	8,700	14	0	160.1
NORTHWESTERN DIVISION.....	91,611	101	1.0	110.2
Benzie county.....	10,981	13	0	118.4
Grand Traverse county.....	23,318	28	.2	120.1
Leelanau county.....	10,911	3	0	27.5
Manistee county.....	27,279	28	0	102.6
Wexford county.....	19,122	29	.8	151.7
NORTHERN DIVISION.....	83,954	214	.78	254.9
Antrim county.....	15,400	35	.2	227.3
Charlevoix county.....	15,903	26	0	163.5
Cheboygan county.....	17,237	65	.2	377.1
Crawford county.....	3,706	6	0	161.9
Emmet county.....	17,248	34	.3	197.1
Kalkaska county.....	7,420	24	.08	323.5
Otsego county.....	7,040	24	0	340.9
NORTHEASTERN DIVISION.....	60,560	162	.96	267.5
Alcona county.....	5,641	19	0	336.8
Alpena county.....	19,966	41	.3	205.3
Iosco county.....	10,330	28	.2	271.1
Montmorency county.....	3,543	13	0	366.9
Ogemaw county.....	8,692	36	.08	414.2
Oscoda county.....	1,900	4	.08	210.5
Presque Isle county.....	10,488	21	.3	200.2
WESTERN DIVISION.....	279,516	299	4.96	107.0
Kent county.....	138,897	120	4	86.4
Lake county.....	5,039	11	0	218.3
Mason county.....	19,868	35	.3	176.2
Muskegon county.....	36,896	31	.2	84.0
Newaygo county.....	18,363	20	.08	108.9
Oceana county.....	17,811	43	.08	241.4
Ottawa county.....	42,642	39	.3	91.5
NORTHERN CENTRAL DIVISION.....	107,635	305	.96	283.4
Clare county.....	9,152	24	.08	262.2
Gladwin county.....	8,326	32	0	384.3
Isabella county.....	24,297	85	.2	349.8
Mecosta county.....	20,445	43	.2	210.3
Midland county.....	14,901	26	0	174.5
Missaukee county.....	10,172	33	.08	324.4
Osceola county.....	18,700	57	.4	304.8
Roscommon county.....	1,642	5	0	304.5

*Estimated for intercensal years.

TABLE 74.—CONCLUDED.

Geographical Divisions.	Average.			
	Population.*	Cases.	Deaths.	Case rates.
BAY AND EASTERN DIVISION.....	348,517	638	2.36	183.1
Arenac county.....	9,918	37	.2	373.1
Bay county.....	64,120	209	.5	326.0
Huron county.....	35,274	61	.3	172.9
Lapeer county.....	27,231	28	.08	102.8
Saginaw county.....	85,417	155	.6	181.5
Sanilac county.....	34,948	58	.3	166.0
St. Clair county.....	55,542	44	.3	79.2
Tuscola county.....	36,067	46	.08	127.5
CENTRAL DIVISION.....	316,847	428	1.8	135.1
Barry county.....	22,237	23	0	103.4
Clinton county.....	25,345	40	.2	157.8
Eaton county.....	31,023	46	.2	148.2
Genesee county.....	42,696	67	.3	156.9
Gratiot county.....	30,330	75	.3	247.3
Ingham county.....	43,728	22	0	50.3
Ionia county.....	35,669	51	.2	145.2
Livingston county.....	18,762	9	0	48.0
Montcalm county.....	33,748	49	.3	145.2
Shiawassee county.....	33,909	46	.3	135.7
SOUTHWESTERN DIVISION.....	143,410	96	.76	66.9
Allegan county.....	39,045	22	.08	56.4
Berrien county.....	49,603	29	.3	58.5
Cass county.....	20,175	14	.08	69.4
Van Buren county.....	34,587	31	.3	89.6
SOUTHERN CENTRAL DIVISION.....	324,759	180	3.28	55.4
Branch county.....	26,109	11	.2	42.1
Calhoun county.....	53,172	62	.2	116.6
Hillsdale county.....	29,834	19	.3	63.7
Jackson county.....	47,192	26	2	55.1
Kalamazoo county.....	49,567	19	.3	38.3
Lenawee county.....	49,094	9	.08	18.3
St. Joseph county.....	23,419	16	.2	68.3
Washtenaw county.....	46,372	18	0	38.8
SOUTHEASTERN DIVISION.....	493,500	262	3.68	53.1
Macomb county.....	33,069	27	.3	81.6
Monroe county.....	33,140	24	.08	72.4
Oakland county.....	45,602	34	.3	74.6
Wayne county.....	381,689	177	3	46.4

*Estimated for intercensal years.

THE PREVALENCE OF SMALLPOX IN URBAN AND RURAL LOCALITIES.

By Table 75 it may be seen that, in 1909, a much greater proportion of urban than rural localities was infected with smallpox. It may also be seen that the case rate (number of cases per 100,000 inhabitants) was much higher in the rural than in the urban localities.

By Table 75A it may be seen that, in 1909, the urban localities which showed much higher case rates from smallpox than the case rate for this disease for the entire State for that year (57.5 cases per 100,000 inhabitants), were: Calumet township, Charlotte, Coldwater, Flint, Grand Haven, Manistique, Menominee, Muskegon, Negaunee, Niles, Norway, Petoskey and Saginaw.

The localities, shown in Table 75A, in which the case rates from smallpox were much lower in 1909 than the rate for the entire State for that year,

were: Battle Creek, Cheboygan, Detroit, Escanaba, Grand Rapids, Holland, Ionia, Ironwood, Ishpeming, Jackson, Kalamazoo, Lansing, Ludington, Pontiac, Port Huron and Sault Ste. Marie.

The localities, shown in Table 75A, which showed much higher case rates from smallpox in 1909 than the average for such localities in the years, 1904-1908, were: Calumet township, Charlotte, Flint, Ironwood, Ishpeming, Manistique, Marquette, Menominee, Muskegon, Negaunee, Niles and Norway.

The localities, shown in Table 75A, which showed much lower case rates from smallpox in 1909 than the average for such localities in the years, 1904-1908, were: Battle Creek, Bay City, Cadillac, Cheboygan, Coldwater, Detroit, Escanaba, Grand Haven, Grand Rapids, Holland, Ionia, Jackson, Kalamazoo, Lansing, Ludington, Petoskey, Pontiac, Port Huron, Saginaw and Sault Ste. Marie.

There were no cases of smallpox reported in 1909 from Adrian, Albion, Alpena, Ann Arbor, Benton Harbor, Big Rapids, Hancock, Hillsdale, Houghton, Iron Mountain, Laurium, Manistee, Monroe, Mt. Clemens, Mt. Pleasant, Owosso, St. Joseph, Traverse City, Wyandotte and Ypsilanti.

TABLE 75.—*The prevalence of smallpox in urban and rural localities, in Michigan, in 1909.*

Localities—Grouped according to density of population.	Population.*	Health jurisdictions.			Cases.	Deaths.	Case rates per 100,000 of the population.
		Total.	Infected.				
			Number.	Per cent of all jurisdictions.			
Cities over 50,000.....	524,498	3	3	100	86	1	16.4
Cities from 25,000 to 50,000.....	154,255	5	5	100	27	0	17.5
Cities from 10,000 to 25,000 and Calumet township (18,628).....	222,289	16	10	63	194	0	87.3
Cities and villages from 5,000 to 10,000.....	185,982	28	14	50	151	0	81.2
Cities and villages under 5,000†.....	352,905	325	27	8	224	0	63.5
Total urban.....	1,439,929	377	59	16	682	1	47.4
Balance of localities—principally townships‡....	1,226,380	1,284	112	9	851	3	69.4

*This footnote is below Table 72, on a preceding page.

†Exclusive of 57 cities and villages, for which the population in 1909 cannot be correctly estimated.

‡Includes the 57 cities and villages mentioned in the preceding paragraph, but does not include Calumet township, which, for the purpose of this study, is included in the third group of urban localities, which have corresponding populations.

TABLE 75A.—*The prevalence of smallpox in 1909, and in preceding years, in each of the principal localities included in the first four groups in Table 75.*

Localities.	1909.			Average, 1904-1908.		
	Population.*	Cases.	Cases per 100,000 inhabitants.	Population.*	Cases.	Cases per 100,000 inhabitants.
Adrian.....	11,963	0	.....	11,193	2	17.9
Albion.....	5,473	0	.....	5,155	9	174.6
Alpena.....	13,148	0	.....	12,699	4	31.5
Ann Arbor.....	14,712	0	.....	14,643	8	54.6
Battle Creek.....	26,776	2	7.5	24,038	42	174.7
Bay City.....	40,509	18	44.4	37,989	+114	300.1
Benton Harbor.....	6,877	0	.....	6,772	.2	3.0
Big Rapids.....	5,060	0	.....	4,935	7	141.8
Cadillac.....	8,013	4	49.9	7,341	6	81.7
Calumet township.....	18,628	35	187.9	17,813	2	11.2
Charlotte.....	5,519	49	887.8	5,043	3	59.5
Cheboygan.....	7,032	2	28.5	6,851	27	394.1
Coldwater.....	6,237	5	80.2	6,230	8	128.4
Detroit.....	366,646	14	3.8	338,435	68	20.1
Escanaba.....	13,035	1	7.7	11,873	12	101.1
Flint.....	17,111	113	660.3	15,775	9	57.1
Grand Haven.....	5,859	5	85.3	5,487	10	182.2
Grand Rapids.....	105,910	18	17.0	99,795	71	71.1
Hancock.....	8,521	0	.....	7,030	0	.....
Hillsdale.....	5,632	0	.....	5,138	5	97.3
Holland.....	10,436	1	9.6	9,554	10	104.7
Houghton.....	5,581	0	.....	4,839	0	.....
Ionia.....	5,239	2	38.2	5,229	5	95.6
Iron Mountain.....	7,764	0	.....	8,256	.8	9.7
Ironwood.....	10,412	1	9.6	10,176	0	.....
Ishpeming.....	9,583	1	10.4	10,807	0	.....
Jackson.....	25,450	1	3.9	25,360	25	98.6
Kalamazoo.....	36,505	2	5.5	32,471	16	49.3
Lansing.....	25,015	4	16.0	22,172	22	99.2
Laurium.....	10,166	0	.....	8,658	0	.....
Ludington.....	7,376	1	13.6	7,306	11	150.6
Manistee.....	10,768	0	.....	11,932	31	259.8
Manistique.....	5,184	46	887.3	4,831	2	41.4
Marquette.....	11,424	5	43.8	10,969	.2	1.8
Menominee.....	8,944	8	89.4	10,235	1	9.8
Monroe.....	7,485	0	.....	6,671	3	45.0
Mt. Clemens.....	7,773	0	.....	7,374	3	40.7
Mt. Pleasant.....	5,512	0	.....	4,895	4	81.7
Muskegon.....	20,995	35	166.7	20,937	27	129.0
Negaunee.....	6,625	14	211.3	6,728	.6	8.9
Niles.....	5,084	5	98.3	4,819	.2	4.2
Norway.....	5,732	5	87.2	5,211	1	19.2
Owosso.....	9,707	0	.....	9,370	17	181.4
Petoskey.....	5,062	4	79.0	5,136	7	136.3
Pontiac.....	12,278	1	8.1	11,442	4	35.0
Port Huron.....	21,116	1	4.7	20,463	8	39.1
Saginaw.....	51,942	54	104.0	48,743	119	244.1
St. Joseph.....	5,531	0	.....	5,406	.6	11.1
Sault Ste. Marie.....	12,572	1	8.0	11,894	13	109.3
Traverse City.....	13,525	0	.....	12,152	15	123.4
Wyandotte.....	5,728	0	.....	5,546	2	36.1
Ypsilanti.....	7,849	0	.....	7,692	7	91.0

*Estimated for intercensal years.

†Does not include West Bay City for 1904, which was consolidated with Bay City in 1905.

THE REPORTED SOURCES OF CONTAGIUM IN SMALLPOX.

Table 76 indicates that in but thirty-two per cent of the outbreaks of smallpox that occurred in the years 1906-9 was the source of contagium traced and reported to this Department. It may be seen that sixty per cent of the outbreaks in which the source was traced was due to the movement, from one locality to another, of persons suffering from or who had been exposed to smallpox. In very many instances the disease was so mild that the patients did not call in a physician or take to their beds, and in this way, many of them were enabled to move from place to place without hindrance by the local health officials.

The places from which and to which smallpox was spread in 1909 are shown in Table 77.

TABLE 76.—*The reported sources of contagium in smallpox, in Michigan, in the four years, 1906-1909, as indicated by the number and per cent of instances in which each of the given sources was responsible for the introduction of the disease into a household.*

Sources.	Number of instances.	Per cent of all instances in which a source was given.
Outside jurisdictions.....	604	60
Traced to former cases in same locality.....	394	39
Infected clothing, mail, etc.....	11	1
Not stated or statements doubtful.....	2,116	*68

*Per cent of all households in which smallpox occurred.

TABLE 77.—*Localities from which and to which smallpox was spread during the year 1909.*

Spread from:	To:	Spread from:	To:
Alger county, Munising village.	Marquette county, Ishpeming city.	Genesee county, Flint city.	Genesee county, Thetford township.
Arenac county, Standish city.	Arenac county, Lincoln township.	Genesee county, Flint city.	Midland county, Ingersoll township.
Arenac county, Standish city.	Arenac county, Omer city.	Genesee county, Flint city.	Shiawassee county, Durand village.
Arenac county, Standish city.	Arenac county, Turner township.	Grand Traverse county, Traverse City city.	Muskegon county, Muskegon city.
Arenac county, Standish city.	Bay county, Bay City city.	Houghton county, Hancock city.	Lapeer county, Almont township.
Arenac county, Standish city.	Genesee county, Flint city.	Houghton county, Quincy township.	Baraga county, Baraga township.
Arenac county, Standish city.	Griiot county, Elba township.	Ionia county, Belding city.	Bay county, Monitor township.
Berrien county, Niles city.	Cass county, Calvin township.	Ionia county, Belding city.	Bay county, Williams township.
Cass county, Calvin township.	Cass county, Volinia township.	Ionia county, Belding city.	Montcalm county, Greenville city.
Chippewa county, (No locality given).	Ingham county, Lansing city.	Ionia county, Belding city.	Sanilac county, Deckerville village.
Eaton county, Charlotte city.	Eaton county, Eaton Rapids township.	Iron county, Iron River village.	Iron county, Bates township.
Eaton county, Eaton Rapids city.	Clinton county, Eagle township.	Jackson county, Jackson city.	Ingham county, Onondaga township.
Genesee county, Flint city.	Bay county, Bay City city.	Kent county, Grand Rapids city.	Kent county, Courtland township.
Genesee county, Flint city.	Genesee county, Clio village.	Kent county, Lowell village.	Emmet county, Potoskey city.
Genesee county, Flint city.	Genesee county, Davison village.	Lapeer county, Imlay City village.	Oakland county, Pontiac city.
Genesee county, Flint city.	Genesee county, Montrose township.	Livingston county, Cohoctah township.	Ingham county, Bunkerhill township.

TABLE 77.—CONTINUED.

Spread from:	To:	Spread from:	To:
Livingston county, Geneva township.	Livingston county, Howell village.	Ogemaw county, Rose City city.	Ogemaw county, Rose township.
Livingston county, Howell village.	Livingston county, Cohoctah township.	Ogemaw county, Rose City city.	Oscoda county, Big Creek township.
Mackinac county, Hendricks township.	Delta county, Escanaba city.	Ogemaw county, Rose City city.	Roscommon county, Richfield township.
Mackinac county, (No locality given).	Chippewa county, Sault Ste. Marie city.	Ogemaw county, Rose City city.	Tuscola county, Denmark township.
Montmorency county, Albert township.	Arenac county, Mason township.	Ontonagon county, Ontonagon village.	Houghton county, Duncan township.
Montmorency county, Albert township.	Presque Isle county, Allis township.	Oscoda county, (No locality given).	Gratiot county, Pine River township.
Montmorency county, Briley township.	Montmorency county, Avery township.	Ottawa county, Jamestown township.	Allegan county, Salem township.
Oceana county, Ferry township.	Oceana county, Shelby village.	Roscommon county, Richfield township.	Roscommon county, Higgins township.
Oceana county, Shelby village.	Oceana county, Elbridge township.	Saginaw county, Blumfield township.	Saginaw county, Frankenmuth township.
Oceana county, Shelby village.	Oceana county, Shelby township.	Saginaw county, Saginaw city.	Ogemaw county, West Branch city.
Oceana county, Shelby township.	Oceana county, Shelby village.	Saginaw county, Thomastown township.	Saginaw county, Tittabawassee township.
Ogemaw county, Goodar township.	Oscoda county, Mentor township.	Schoolcraft county, Manistique city.	Schoolcraft county, Hiawatha township.
Ogemaw county, Rose City city.	Clinton county, Elsie village.	Schoolcraft county, Manistique city.	Schoolcraft county, Manistique township.
Ogemaw county, Rose City city.	Iosco county, Baldwin township.	Wayne county, Detroit city.	Livingston county, Marion township.
Ogemaw county, Rose City city.	Iosco county, Sherman township.	Wayne county, Detroit city.	Tuscola county, Novesta township.
Ogemaw county, Rose City city.	Ogemaw county, Foster township.	Wayne county, Detroit city.	Wayne county, Hamtramck township.

TABLE 77.—CONCLUDED.

Spread from:		To:	
FROM OUTSIDE THE STATE TO LOCALITIES IN MICHIGAN.			
Illinois, Chicago.	Berrien county, Oronoko township.	Oklahoma, (No locality given).	Eaton county, Charlotte city.
Illinois, Chicago.	Eaton county, Charlotte city.	South Dakota, (No locality given).	Berrien county, Watervliet village.
Indiana, South Bend.	Berrien county, Stevensville village.	Texas, (No locality given).	Eaton county, Charlotte city.
Indiana, South Bend.	Branch county, Coldwater township.	Wisconsin, (No locality given).	Gogebic county, Wakefield township.
Kentucky, (No locality given).	Wexford county, South Branch township.	Wisconsin, (No locality given).	Menominee county, Menominee city.
Minnesota, (No locality given).	Midland county, Porter township.	Wisconsin, (No locality given).	Ottawa county, Holland city.
New York, (No locality given).	Eaton county, Charlotte city.	Wisconsin, Superior.	Gogebic county, Ironwood city.

RESTRICTIVE AND PREVENTIVE MEASURES IN SMALLPOX.

Placarding, isolation and disinfection.—Table 78 indicates that in but eighty-one per cent of the households in which smallpox occurred in 1906-9 were the restrictive measures of placarding, isolation and disinfection enforced. In the case of the 12 per cent of households where the restrictive measures were probably not carried out, the neglect may have been due to the fact that, in many instances, owing to the mild character of the disease, the health officer was not satisfied with the diagnosis, or was not notified in time to institute these restrictive measures, particularly those of placarding and isolation. In nearly every outbreak investigated by this Department, since the present mild type of smallpox became widespread, in which the disease was in doubt, it has proven to be smallpox; and very many cases of smallpox might have been prevented each year if the health officers had adopted the policy of giving the public the benefit of the doubt by the prompt institution of restrictive measures.

Vaccination of sick persons.—Table 78 indicates that seventy-two, and, possibly, eight-nine, per cent of all persons sick from smallpox in 1906-9 had not been vaccinated. This section of Table 78 may well be studied in connection with Table 78A, in which is shown the periods of time which elapsed between vaccination and sickness from smallpox, in certain instances, in the years 1904-9.

TABLE 78.—*Restrictive and preventive measures in smallpox, in Michigan, in the four years, 1906-1909.*

Restrictive and preventive measures.	Number.	Per cent of all cases or households.
PLACARDING, ISOLATION AND DISINFECTION:		
Households in which enforced.....	2,536	81
Neglected.....	222	7
Not stated or statements doubtful.....	367	12
VACCINATION OF SICK PERSONS:		
Cases vaccinated at commencement of or prior to sickness*.....	772	11
Not vaccinated.....	4,896	72
Not stated or statements doubtful.....	1,123	17

*The time of vaccination of sick persons in 1904-1909 is shown in Table 78A.

TABLE 7SA.—*The time which elapsed between previous vaccination and the beginning of sickness in smallpox patients, in Michigan, in the six years, 1904-1909.**

Time.....	Same day.	1 day.	3 days.	4 days.	5 days.	7 days.	9 days.	10 days.	14 days.	21 days.	1 mo.
No. of cases.....	71	6	5	1	10	11	1	4	1	4	7
Time.....	2 mos.	4 mos.	1 yr.	2 yrs.	3 yrs.	4 yrs.	5 yrs.	6 yrs.	7 yrs.	8 yrs.	9 yrs.
No. of cases.....	1	1	23	121	66	48	49	31	21	16	5
Time.....	10 yrs.	11 yrs.	12 yrs.	13 yrs.	14 yrs.	15 yrs.	16 yrs.	17 yrs.	18 yrs.	20 yrs.	21 yrs.
No. of cases.....	20	1	6	5	2	9	4	2	2	52	2
Time.....	24 yrs.	25 yrs.	26 yrs.	29 yrs.	30 yrs.	31 yrs.	35 yrs.	40 yrs.	43 yrs.	45 yrs.	50 yrs.
No. of cases.....	1	13	3	2	20	1	3	9	1	1	5
Time.....	53 yrs.	55 yrs.	60 yrs.	1-2 yrs.	1-10 yrs.	2-10 yrs.	2-40 yrs.	3-4 yrs.	3-13 yrs.	3-20 yrs.	3-45 yrs.
No. of cases.....	1	2	3	1	1	5	24	1	4	8	3
Time.....	5-25 yrs.	6-8 yrs.	7-8 yrs.	7-18 yrs.	8-15 yrs.	10-12 yrs.	10-14 yrs.	10-15 yrs.	12-14 yrs.	15-20 yrs.	20-25 yrs.
No. of cases.....	1	1	2	2	1	9	2	8	3	1	2
Time.....	20-30 yrs.	30-40 yrs.									
No. of cases.....	1	1									

*There were 599 cases, not included in this table, which had been vaccinated prior to the sickness from smallpox, but in which the time of vaccination was indefinite or not stated.

Results of restrictive measures.—Table 79 is somewhat similar to tables relative to the results of restrictive measures in smallpox, in the annual reports of this Department ending with the year 1904, the principal difference being that the disease is now studied by *households* instead of *outbreaks*. It is believed that, with a continuation of the table for a number of years, a much better, and certainly a much more reliable, showing can be made than in the preceding reports.

TABLE 79.—*Showing the total number of households in which smallpox was present during the four years, 1906-1909, together with the total number of cases and deaths and the average number of cases in each household in which the restrictive and preventive measures were enforced or neglected.*

	Total number of households, 3,125.		Restrictive measures enforced in 2,506 households.		Restrictive measures neglected in 222 households.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Totals.....	6,791	23	5,257	22	649	0
Average number per household.....	2.17	*	2.10	*	2.92	0

*The average deaths per household are too small to be considered.

CHICKEN-POX (VARICELLA) IN MICHIGAN IN 1909.

During the year ending December 31, 1909, chicken-pox was reported present in twenty-two localities in the State, 124 households being infected with a total of 266 cases, including two deaths.

So far as known, the restrictive measures of isolation and disinfection were fully carried out in but 68 of the 124 households infected, but this is a marked improvement over former years.

MUMPS (PAROTITIS) IN MICHIGAN IN 1909.

During the year 1909, five cases of mumps (parotitis), including two deaths, were reported to this Department.

ERYSIPELAS IN MICHIGAN IN 1909.

During the year 1909 reports were received relative to 115 cases of erysipelas in the State, 105 of which proved fatal.

LEPROSY IN MICHIGAN IN 1909.

One case of leprosy was discovered in Calumet township. No disposition of the case had been decided upon at the close of the year.

TETANUS (LOCK-JAW) IN MICHIGAN IN 1909.

During the year 1909 there were reported to this Department, from twenty localities in the State, twenty-six cases of tetanus, all of which terminated fatally.

Of the twenty-six cases, in which a source of infection was stated, three were due to wounds from toy pistols; three to blank cartridge wounds; two to wounds from rusty nails; two to injuries to limbs, and one each to the following causes:

Infection in open wound, extraction of tooth, wound under eye caused by a sliver, wound in arm and wound in breast.

In fourteen instances, the average period of incubation (from the time of the wound or injury until tetanus developed) was 6.4 days.

In seventeen instances, the average duration of sickness in fatal cases (from the time tetanus developed until death occurred) was 3.9 days.

The average ages of all persons suffering from tetanus were: For males 17.2 years, and for females 4 years.

DISEASES OF ANIMALS, DANGEROUS TO MAN, IN MICHIGAN, IN 1909.

Whenever information is received at this office of the occurrence of an outbreak of any disease of animals, which, by reason of its communicability, may be considered dangerous to man, efforts are made to learn all facts relative to such outbreaks. The matter is reported to the State Live Stock Sanitary Commission, and the attention of the health officials of the locality where the disease is reported present is called to the fact of its reported prevalence, and they are requested to take immediate measures for the prevention of its spread, by establishing and maintaining quarantine over the diseased animals, until relieved by the State Live Stock Sanitary Commission.

During the year 1909, three diseases of this character were reported to this Department, they being rabies (hydrophobia), glanders (farcy) and actinomycosis (lumpy jaw).

RABIES (HYDROPHOBIA) IN MICHIGAN IN 1909.

During the year 1909 there were reported to this Department fourteen outbreaks of rabies in animals, resulting in sixteen reported cases. Thirteen of these outbreaks were caused by dogs and one by cattle.

In the outbreaks caused by dogs sixteen persons were bitten, resulting in the death of two of them. Fourteen of the persons bitten were sent to the Pasteur Institute at Ann Arbor for treatment.

GLANDERS (FARCY) IN MICHIGAN IN 1909.

During the year 1909 two outbreaks of glanders (farcy) among animals and one case of a man were reported to this Department.

ACTINOMYCOSIS (LUMPY JAW) IN MICHIGAN IN 1909.

During the year 1909 two outbreaks of actinomycosis (lumpy jaw) among cattle were reported to this Department.

ALLEGED NUISANCES IN MICHIGAN IN 1909.

During the year 1909 communications relative to 124 alleged nuisances in Michigan were received at the office of the Secretary of this Board.

The causes, to which the alleged nuisances mentioned in the communications were attributed, may be classified as follows:

Refuse dumped on ground, 22; slaughter houses, 21; barnyard and manure heaps, 16; privies, 12; unburied and insufficiently buried animals, 10; pollution of streams, 8; stagnant water, 7; cesspools, 7; open drains, 6; insanitary houses, 5; pig-pens, 3; defective drains, 2; pollution of lakes, 2; curing hides in basement of meat market, 1; feeding the carcass of a horse to fowls, 1, and chicken-coops, 1.

Whenever the complaint of an alleged nuisance is received at this office, the health officer, whose duty it is to act, is usually informed of the nature of the nuisance, and is requested to investigate the same. At the same time, the sections of law and pamphlets, publications of this Board, pertaining to nuisances and to the duties of local boards of health relative thereto, are sent to him and to the person making the complaint.

The State Board of Health had no authority, under the old law, to abate nuisances, simply advising local boards of health in regard thereto, but the new law, Act 293, P. A. 1909, confers that power on this Board through its medical inspector, who shall act under the direction of the State Board of Health. This Board will exercise its authority in this matter only in cases where the local boards refuse or neglect to do their duty.

INDEX.

INDEX.

	Page.
Actinomycosis (Lumpy jaw), in Michigan, in 1909.....	165
Bacteriological laboratory, report of the work in.....	36-44
summary of examinations in.....	36-44
Beet sugar factories, in Germany, investigation relative to methods of disposal of wastes from.....	29-36
inspection of at Blissfield.....	20-29
inspection of at Caro.....	25-29
Blissfield, inspection of the beet sugar plant at.....	25-29
Board of Health, State, annual reports of the.....	16
general and special work in the office of the.....	14-36
members of the.....	5
movements of the secretary of the.....	18-20
regular and special meetings of the.....	11-13
Bulletins, "Public Health, Michigan," fiscal year, 1910.....	16-17
Caro, inspection of the beet sugar plant at.....	25-29
Chicken-pox (Varicella), in Michigan, in 1909.....	164
Communicable diseases (indexed "Diseases, communicable").	
Compilation, methods of.....	50
purposes of.....	49
Diphtheria, in Michigan, antitoxin treatment in.....	120-121
general prevalence of.....	110-112
geographical distribution of.....	112-114
in 1909 and preceding years.....	110-121
prevalence of in urban and rural localities.....	114-116
restrictive and preventive measures in.....	119-121
sources of contagium in.....	117-118
spread from one locality to another.....	118-119
laboratory work in connection with.....	37, 41-42
Diseases, communicable, in Michigan, in 1909 and preceding years.....	49-165
of animals, dangerous to man, in Michigan, in 1909.....	165
Drinking cup, common, resolution relative to the abolishment of.....	11-13
Drowned, placards relative to the resuscitation of the.....	17
Embalmers, examination and licensing of.....	14
Erysipelas, in Michigan, in 1909.....	164
Farcy (indexed "Glanders").	
Fever, scarlet, in Michigan, general prevalence of.....	127-129
geographical distribution of.....	129-131
in 1909 and preceding years.....	127-138
prevalence of in urban and rural localities.....	131-133
restrictive and preventive measures in.....	137-138
sources of contagium in.....	134
spread from one locality to another.....	135-137
typhoid, in Michigan, general prevalence of.....	94-95
geographical distribution of.....	95-98
in 1909 and preceding years.....	94-109
prevalence of in urban and rural localities.....	98-101
restrictive and preventive measures in.....	108-109
sources of contagium in.....	101-103
spread from one locality to another.....	104-107

	Page.
Financial report, of the State Board of Health.....	45-46
Formaldehyde disinfection, laboratory work in connection with.....	42-44
Glanders (Farcy), in Michigan, in 1909.....	165
Hydrophobia (indexed "Rabies").	
Information, collection of.....	15
dissemination of.....	15
Leprosy, in Michigan, in 1909.....	164
Lock-jaw, (indexed "Tetanus").	
Lumpy jaw (indexed "Actinomycosis").	
Measles, in Michigan, general prevalence of.....	138-139
geographical distribution of.....	140-142
in 1909 and preceding years.....	138-151
restrictive and preventive measures in.....	150-151
sources of contagium in.....	143
spread from one locality to another.....	144-150
Medical inspectors, State, localities visited by the.....	18-22
Meningitis, in Michigan, duration of sickness in.....	91-92
general prevalence of.....	84-85
geographical distribution of.....	86-87
influence of age and sex in.....	91-92
in 1909 and preceding years.....	84-93
prevalence of in urban and rural localities.....	87-89
restrictive and preventive measures in.....	93
seasonal prevalence of.....	90
sources of contagium and predisposing influences in.....	90-91
tubercular and traumatic, 1899-1909.....	85
Mumps (Parotitis), in Michigan, in 1909.....	164
Neostyle work, summary of.....	16
Nuisances, alleged, in Michigan, in 1909.....	166
Parotitis (indexed "Mumps").	
Plans for State buildings, examination of.....	13
Pneumonia, in Michigan, duration of sickness in.....	58, 60
general prevalence of.....	50-51
geographical distribution of.....	51-53
influence of age and sex in.....	56-57
influence of occupation in.....	61-62
in 1909 and preceding years.....	50-63
period of incubation in.....	60-61
predisposing influences in.....	59-60
prevalence of in urban and rural localities.....	53-55
restrictive and preventive measures in.....	63
seasonal prevalence of.....	56
sources of contagium in.....	60
Rabies (Hydrophobia), in Michigan, in 1909.....	165
Reports, general plan of.....	50
Sanitary engineer, work in the division of.....	20-36
Scarlet fever (indexed "Fever, scarlet").	
School work.....	18
Schools of embalming, resolution relative to non-recognition of.....	11
Smallpox, in Michigan, general prevalence of.....	151-152
geographical distribution of.....	153-155
in 1909 and preceding years.....	151-164
prevalence of in urban and rural localities.....	155-157
restrictive and preventive measures in.....	161-164
sources of contagium in.....	158
spread from one locality to another.....	159-161

State Board of Health (indexed "Board of Health, State")	Page.
medical inspectors (indexed "Medical inspectors, State").	
Tetanus (Lock-jaw), in Michigan, in 1909.	165
Tuberculosis exhibit, Michigan.	18
in Michigan, bacteriological diagnosis of.	83
civil condition of patients.	74
duration of sickness in.	81-82
general prevalence of.	64-65
geographical distribution of.	65-67
influence of age and sex in.	72-73
influence of color in.	73-74
influence of occupation in.	74-81
in 1909 and preceding years.	64-83
location of the disease in cases of.	70
predisposing influences and premonitory symptoms in.	71-72
prevalence of in urban and rural localities.	67-69
restrictive and preventive measures in.	82-83
seasonal prevalence of.	69-70
sources of contagium in.	71
laboratory work in connection with.	37, 39-40
Typhoid fever (indexed "Fever, typhoid").	
Varicella (indexed "Chicken-pox").	
Vassar, investigation relative to beet sugar sewage in Cass river at.	22-25
Water examinations, summary of.	38-39
potable.	37-38
Whooping-cough, in Michigan, general prevalence of.	122-123
geographical distribution of.	122, 124-125
in 1909 and preceding years.	122-127
restrictive and preventive measures in.	127
sources of contagium in.	125-126
spread from one locality to another.	126

